SOCIETY OF AMERICAN FORESTERS 1900

Journal of FORESTRY

February 1959
Volume 57
Number 2

INDIAN

FIRE PUMPS

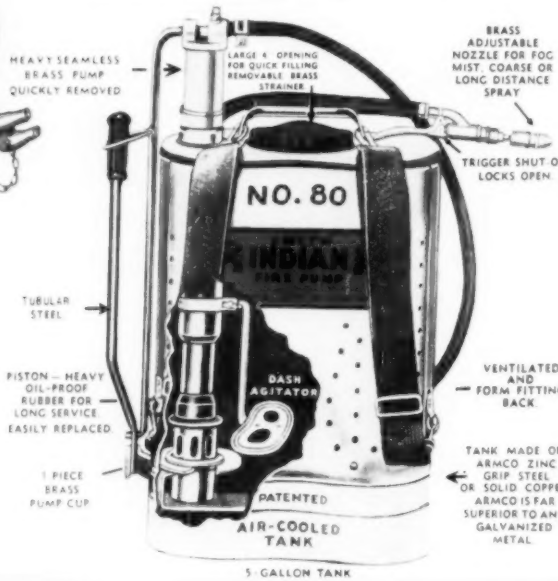
get "HEAP BIG RESULTS" from little water!

Fire fighting authorities who have experimented with a "WET WATER" powder mixed with the water in an **INDIAN FIRE PUMP** tank report it does an excellent job.

Grass, rubbish, brush, roof or spot fires may occur any time. Don't let these aggravating small fires send you on the warpath. Whoop up your fire fighting with INDIAN FIRE PUMPS!

Versatile, rugged, dependable INDIAN FIRE PUMPS have been the fireman's best friend for many, many years. They carry Underwriters' Laboratories approval. Spare parts are always available.

INDIANS provide the *most* fire protection for the *least* cost!


HEAVY SEAMLESS BRASS PUMP QUICKLY REMOVED
LARGE 4" OPENING FOR QUICK FILLING REMOVABLE BRASS STRAINER
BRASS ADJUSTABLE NOZZLE FOR FOG MIST, COARSE OR LONG DISTANCE SPRAY
TRIGGER SHUT-OFF LOCKS OPEN
NO. 80
INDIAN
FIRE PUMP
TUBULAR STEEL
PISTON — HEAVY OIL-PROOF RUBBER FOR LONG SERVICE EASILY REPLACED
DASH AGITATOR
VENTILATED AND FORM FITTING BACK
1 PIECE BRASS PUMP CUP
TANK MADE OF ARMCO ZINC GRIP STEEL OR SOLID COPPER ARMCO IS FAR SUPERIOR TO ANY GALVANIZED METAL
PATENTED
AIR-COOLED TANK

5 GALLON TANK

No. 80 INDIAN

(Lever Type Pump and Handle)

Heavy steel pump lever. Ventilated tank. 5 gal. capacity. Continuous high pressure. Armco zinc-grip steel or glistening solid brass tank. Strongest construction throughout. Has no equal.

No. 90 INDIAN

(SLIDING PUMP TYPE)

Form fitting, ventilated tank permits constant circulation of air between tank and carrier's back. No dampness. Leaves arms free for climbing ladders, etc. Highly popular for many years.

WRITE FOR CATALOG

1888

D. B. SMITH & CO. *"For Over 70 Years the Leaders"*
407 MAIN ST., UTICA 2, N. Y.

PACIFIC COAST BRANCHES

Hercules Equipment & Rubber Co., Inc.
San Francisco 7, Cal.

Hesperia Supply Co.
Los Angeles 58, Cal.

Fred E. Burnett Co.
Portland, Ore.

Fred E. Burnett Co.
Klamath Falls, Ore.

Hill & Nims Supply, Inc.
Seattle, Wash.

L. M. Curtis & Sons
Salt Lake City, Utah

CANADIAN AGENTS

Hoch Bros. Limited
Vancouver, B.C.

C. E. Hickey & Sons, Ltd.
Hamilton

VOLUME 57
NUMBER 2

Journal of Forestry

FEBRUARY 1959

EDITORIAL STAFF

ARTHUR B. MEYER ..... *Editor*
HENRY CLEPPER ..... *Managing Editor*
L. AUDREY WARREN ..... *Business Manager*

Associate Editors

JAMES S. BETHEL, *Forest and Wood Utilization*, School of Forestry, North Carolina State College, Raleigh, N. C.

C. ALLEN BICKFORD, *Mensuration*, Northeastern Forest Experiment Station, 102 Motors Avenue, Upper Darby, Pa.

ROBERT E. DILS, *Watershed Management*, College of Forestry and Range Management, Colorado State University, Fort Collins, Colo.

JOHN W. DUFFIELD, *Silviculture*, Col. W. B. Greeley Forest Nursery, Nisqually, Wash.

LEE M. JAMES, *Forest Economics and Policy*, Department of Forestry, Michigan State University, East Lansing, Mich.

HARVEY J. MACALONEY, *Forest Pathology and Entomology*, Lake States Forest Experiment Station, St. Paul Campus, University of Minnesota, St. Paul 1, Minn.

CHARLES E. POULTON, *Range Management*, % East Gulfcoast Research Center, Southern Forest Experiment Station, P.O. Box 311, Brewton, Ala.

WILLIAM E. REIFSNYDER, *Forest Fire*, School of Forestry, Yale University, New Haven, Conn.

GEORGE H. SCHROEDER, *Forest Management and Engineering*, Crown Zellerbach Corporation, Public Service Building, Portland 4, Ore.

PHILIP C. WAKELEY, *Forest Genetics and Artificial Regeneration*, Southern Forest Experiment Station, 704 Lowich Building, 2026 St. Charles Avenue, New Orleans 13, La.

LEE E. YEAGER, *Forest-Wildlife Management and Recreation*, Colorado Cooperative Wildlife Research Unit, 243 Forestry Building, Colorado State University, Fort Collins, Colo.

LLOYD THORPE, *Advertising Representative*, 212 General Insurance Building, Seattle 5, Wash.

THE JOURNAL OF FORESTRY, established in 1917, is the official organ of the Society of American Foresters, but the Society assumes no responsibility for the statements and opinions expressed by contributors.

Publication office, 425 Mills Building, 17th Street at Pennsylvania Avenue N. W., Washington 6, D. C. Address all correspondence concerning editorial or business matters to JOURNAL OF FORESTRY, 425 Mills Building, 17th Street at Pennsylvania Avenue N. W., Washington 6, D. C. Published monthly. Subscription $7.50 per year; single copies 75 cents. Missing numbers will be replaced without charge provided claim is made within thirty days after date of the following issue.

The editors are not responsible for loss or damage of manuscripts and photographs while in transit or in their possession. All material submitted for publication should be accompanied by return postage.

Copyright, 1959, by the Society of American Foresters. Second class postage paid at Washington, D. C. and at additional mailing offices.

CONTENTS

COVER: The Makiki Nursery Station of the Hawaiian Board of Agriculture and Forestry in 1911. Photo by Dr. Joseph F. Rock. See page 89.

(Courtesy U.S. Forest Service.)

The Beginning Five Decades of Forestry in Hawaii — Ralph Sheldon Hosmer — 83

The Consumer's Attitude Toward Lumber in Exterior Walls of Houses — Joseph Zaremba — 90

Leader Forking of Red and White Pines in Plantations — Robert A. McCabe and Ronald F. Labisky — 94

Grazing and Douglas-Fir Establishment in the Oregon White Oak Type — F. C. Hall, D. W. Hedrick, and R. F. Keniston — 98

Two New Formulae for Predicting Growth Percent — Harold Cahill Belyea — 104

Obtaining Vertical Aerial Photographic Coverage with a 35 mm Camera — J. W. Willingham — 108

Statistics from Schools of Forestry for 1958: Degrees Granted and Enrollments — Gordon D. Marckworth — 111

Converting Scrub Oak Sandhills to Pine Forests in Florida — Frank W. Woods — 117

Effect of Gibberellin on Conifers: Generally Negative — Arthur H. Westing — 120

Notes and Observations — 123

Planting Following Prescribed Fire; Georgia's Seed Certification Program; Distinguishing Annual Rings in Diffuse Porous Tree Species; Multi-Seeded Acorns; Drainage of Swamp Lands for Forestry Purposes in Finland.

Book Reviews — 130

Land: The Yearbook of Agriculture; Forestry in Sweden; The Living Forest; Conservation of Natural Resources; The Colonel William B. Greeley Lectures in Industrial Forestry; Publications of Interest.

Current Literature — 134

Society Affairs — 135

Forestry News — 152

Index to Advertisers — 160

You're In Business With New, "POWERED-UP" OREGON® Chipper Chain

These Features Give Your Saw "POWERED-UP" Performance!

NEW, "POWERED-UP" CUTTERS

Wood-hungry cutters with longer life . . . keener cutting edges . . . hard chrome. Bar-contoured bottoms for less wear.

NEW, "POWERED-UP" TIE STRAPS

Hardened and bar-contoured to fight wear and friction. Strong flat top design. Countersunk, burnished rivet holes.

NEW, "POWERED-UP" DRIVE LINKS

Hardened heavy gauge steel, stable design with burnished rivet holes. Stress and stretch proofed.

NEW, "POWERED-UP" RIVETS

Precision made for full-contact bearing area and low friction.

OREGON-IZE® Your Saw . . . . . To Make Every Cut Count!

Tell Your Dealer: "OREGON"

You Don't Have to "Baby" This Chain!

COPYRIGHT 1958 BY **OMARK Industries Inc. • OREGON Saw Chain Div.** PORTLAND 22, OREGON

Journal of Forestry

Official Organ of the Society of American Foresters

The Beginning Five Decades of Forestry in Hawaii

Ralph Sheldon Hosmer

SINCE the Territory of Hawaii became "an integral part of the United States," by annexation in August 1900, forestry has played a vital role in that group of islands in the North Pacific. But just as the eight inhabited islands of the Territory occupy a unique geographic place in the "Sisterhood of the States," so in Hawaii has wise forest management differed in essential ways from forms of forestry practice usual on the Mainland.

In a word, in Hawaii the most valuable product of the forest is water, rather than wood. It follows that conservation of its watersheds by keeping them permanently clothed with protection forests, is there the chief duty of the forester.

Today, watershed management has come to be recognized as one of the major multiple uses of forests. This was not true in 1903. To Hawaii belongs the credit of being the first State or Territory to inaugurate as an official policy such a conservation measure. That policy was accepted and over the years has been given consistent support by the Territorial Legislature. For half a century it has been looked upon as an essential part of the "Law of the Land."

Because the significance of this action seems not generally to be realized on the Mainland, and also because there is much that is of interest in the development of the project itself, it is felt desirable that a firsthand historical account of this incident, by one of the foresters who was active in its early stages, should be on record in the JOURNAL OF FORESTRY. It covers the years from January 1904 to June 1955, divided into three parts; the periods of the respective administrations of the first three Territorial Foresters: Ralph Sheldon Hosmer, Charles Sheldon Judd, and William Crosby. In this way the more important forestry developments in the Territory can be noted in chronological order.

RALPH S. HOSMER

First, a few basic facts as to the Hawaiian Islands. The location is 2,100 miles southwest of California. They lie just south of the Tropic of Cancer. Consequently the climate is sub-tropical as is, in consequence, the indigenous flora.

The islands are volcanic in origin and mountainous in character. The higher peaks rise to elevations of just under 14,000 feet on the largest island, Hawaii; of 10,000 feet on Maui; and of 4,000 and 5,000 feet on Oahu and on Kauai.

As a further bit of background it may be said that "the land surface of the eight main Hawaiian Islands aggregates a little under 6,500 square miles, or in round numbers, a little over 4,000,000 acres." For comparison, the combined area of the states of Connecticut and Rhode Island is 6,213 square miles.

The Territory is blessed with plentiful and, as to the seasons, evenly distributed rainfall, in that the eight main islands lie within the northeast trade-wind belt with its moisture laden clouds. On the steep, forested slopes on the windward sides of the mountains, from sea level up to approximately 6,000 feet elevation, the precipitation is heavy, amounting in many localities to more than 400 inches per annum. But also to be remembered is the fact that the upper slopes of the high mountains shut off the trade-wind rains from their leeward sides. In such areas the precipitation may be scant and irregular; in places as low as 10 inches a year.

From the agricultural and economic standpoint, however, some of the most fertile lands are those on the dry, warm, sheltered lee sides of the five larger islands, *provided* they can receive adequate supplies of water through irrigation.

Here is where the role of forestry comes in. Protection forests

THE AUTHOR is professor of forestry emeritus, Cornell University, Ithaca, N. Y. He was the first Territorial forester of Hawaii and is a Fellow and a Charter Member of the Society of American Foresters.

prevent erosion of the catchment areas, reduce to a considerable extent the excess run off from watersheds, and in partnership with irrigation enterprises help to safeguard and assure the quantities of water essential for the domestic supplies of the several islands and also for the amounts needed for economic use. As Judd once summed it up, back in 1931: "The practical work of Forestry in Hawaii consists in clothing the watersheds with the best possible association of trees, plants, and other vegetation, for holding back the excessive run off."

The chief industry of Hawaii is the growing, manufacture and marketing of cane sugar. More than half of the lands cultivated for sugar cane are irrigated. All possible sources of water are being utilized by the sugar industry: streams, springs, wells—both flowing and artesian—and tunnels into mountain sides to intercept ground water channels in the volcanic rocks. Prior to 1926 over $19,000,000 is reported to have been "spent by the plantations in irrigation equipment alone." New projects are constantly being added. In 1958 an elaborate one was in progress to tap streams on the windward side of Molokai to bring water through tunnels to irrigate lands to leeward.

Support from Industry

In control of the sugar industry of the Territory is the Hawaiian Sugar Planters Association. Set up in its present form in 1895, it acts for the affiliated plantations through close knit inter-organization. One of its features is the H.S.P.A. Experiment Station, for "the maintenance, advancement, improvement and protection of sugar in Hawaii." Its staff is made up of specialists in various branches of science, supported entirely by the funds of the plantations.

It was therefore no mere flash in the pan when in the session for 1903 of the Legislature of Hawaii, a bill was introduced, at the instance of the Sugar Planters, to set up a Territorial Board of Commissioners of Agriculture and Forestry as one of its specific divisions, and with provisions that authorize forest reserves, "more particularly for protecting and developing the springs, streams, and sources of water supply."

The bill called for the employment of a professional forester to head the Division of Forestry. Such a requirement was in that year, 1903, in effect in only three mainland states: New York, 1900, Pennsylvania, 1901, and Connecticut, 1901.

The bill was signed by Governor Sanford B. Dole on April 25, 1903, as Act 44 of that legislative session.

Organization

At once after the organization of the Board of Commissioners, its president, Hon. Lorrin A. Thurston, for many years one of the leading public men of Hawaii, wrote to Gifford Pinchot, then head of the Bureau of Forestry, U. S. Department of Agriculture, requesting his advice. Mr. Pinchot sent William L. Hall to the Islands for a first-hand study of conditions. His report was published as Bulletin 48 of the Bureau of Forestry, U. S. Department of Agriculture, 1904, "The Forests of the Hawaiian Islands."

On recommendation of Mr. Pinchot, Ralph Sheldon Hosmer, M.F., 1902, Yale, then chief of the Section of Forest Replacement of the Bureau, was appointed by the Board as "Superintendent of Forestry" of the Territory of Hawaii, effective December 15, 1903. He reported for duty in Honolulu on January 13, 1904. The title was changed later to "Territorial Forester." During the ten and a half years he served Hawaii, Hosmer also held the post of collaborator in the U. S. Forest Service by appointment of Gifford Pinchot. This position kept the Hawaiian Division of Forestry in close touch with the Forest Service. It also permitted the use of federal equipment.

The second Territorial forester of Hawaii was Charles Sheldon Judd who served from July 1, 1915, until his untimely death on June 29, 1939. Judd was born in Honolulu on July 11, 1881, a grandson of Dr. G. P. Judd, a medical missionary to Hawaii in 1827. The Judds have been a prominent family in the Hawaiian Islands ever since. "Charlie" was graduated from Yale, A.B., 1905, M.F., 1907. He was first with the Forest Service in Region 6. In 1911 and 1912 he acted for a time as commissioner of public lands in Hawaii. He then returned to Portland, Oregon, to be assistant regional forester, Region 6, until 1915.

The third Territorial forester was William Crosby, who succeeded Judd in July 1939. He received from Yale University the B.S. degree, Sheff., 1911, and the M.F. in 1913. After a number of years service with the Philippine Bureau of Forestry, he was in the U. S. Forest Service on the Mainland, and then with the Tropical Plant Research Foundation. From 1927 to 1939 he was in charge of the forestry work on the Island of Maui, as associate forester. He organized the program of the Civilian Conservation Corps in Hawaii, and carried that work forward to its completion. Crosby was officially retired on June 30, 1952, but in 1953 was recalled to the office to serve again until June 30, 1955.

The Field of Work

In general it may be said that organized forestry in Hawaii has four main purposes, all inter-related.

The forest reserve system.—The creation and effective maintenance, as "protection forests," of an organic system of forest reserves on the catchment areas of the five main islands, with water as the principal product.

Forest planting.—1. In the forest reserves, (a) with local species, (b) with exotic species.

2. Experimentation with, and subsequent planting of species of trees which have economic value for lumber and/or other uses. Many of these are from other subtropical parts of the world; a considerable number from Australia and New Zealand.

CHARLES S. JUDD

3. Trial of species of coniferous trees from the temperate zone, generally at elevations of from 6,000 to 11,000 feet, above the tradewind belt, especially on the higher mountains on the islands of Maui and Hawaii.

Notes on such plantings follow, in the accounts of the administrations of the three Territorial foresters whose periods of service are covered in this statement.

Forest fire prevention.—Hawaii is fortunate in having relatively low forest fire hazard. But the aim of the Division of Forestry has always been *to be prepared.* In this, its forest fire warden organization has one distinctive feature. The fifty-odd positions of local fire wardens are held by sugar plantation managers, or by ranch managers, who serve voluntarily. As these men have laborers constantly at command, forest fire calls are speedily and efficiently handled. On the island of Oahu the U. S. Army has given aid on many occasions.

Public relations.—To keep the public informed of its work has always been a function of the Hawaiian Division of Forestry. From January 1904 to March 1933, the Board published a monthly magazine, *The Hawaiian Forester and Agriculturist,* in which appeared reports from the Territorial forester, in addition to timely articles on various phases of forestry and of conservation.

There also are to be found the reports and proclamations concerning the forest reserves. Biennial reports recorded the activities of the several divisions of the Board. In many cases these volumes were illustrated.

From an organization standpoint the watershed conservation program, authorized by Act 44 of 1903, narrowed down to a series of very definite objectives, each closely knit with all the rest. Some needed to precede others. Because of this, each of the first three Territorial foresters found specific duties awaiting him, and so was personally responsible for bringing certain parts of the program into complete working order.

The First Decade: 1904-1914

Under Ralph S. Hosmer, the first step was, obviously, to undertake the legal organization of the forest reserve system. This was given a fortunate start when Governor George R. Carter invited Hosmer, with other territorial officials, to accompany him on a five weeks trip to the "Big Island," Hawaii, in January and February, 1904. Later Hosmer made similar trips with Governor Carter to the islands of Maui and Kauai. These circuits afforded unequalled opportunities to see much terrain under favorable circumstances, and along the way to meet almost all the sugar plantation managers and ranch managers, with whom later he had much to do.

A procedure as to the creation of forest reserves was soon worked out including field examinations by the forester, and full discussion on the ground with all concerned. Then a boundary line was drawn, regardless of ownership; for both government and privately owned lands were included. As the majority of the latter were controlled by sugar interests, the owners were usually in favor of the objectives sought. So far as practicable the boundary lines followed natural

WILLIAM CROSBY

boundaries, to reduce the cost of fencing.

Public hearings were duly called and held. If no serious objections arose, the Governor then issued a proclamation setting apart as a forest reserve the included lands that belonged to the Territory. The proclamation became effective on publication. Each carried a metes and bounds description of the boundaries, based on a survey by the Territorial survey office. Act 44 of 1903 provided that private lands could be turned over to the Division of Forestry for management, with a reduction of taxes.

The first reserve was set apart on November 10, 1904, on the Island of Oahu, 913 acres, all land belonging to the Territory. The creation of forest reserves continued to be Hosmer's primary duty as superintendent of forestry. When he resigned in August 1914 to return to the Mainland, the total area of the then 37 forest reserves, was 798,214 acres, of which 546,222 acres (68 percent) belonged to the Territory.

The fencing of the boundaries of the forest reserves to keep out domestic stock and the employment of forest rangers to protect those areas and of hunters to kill off the wild cattle, sheep, goats and pigs, was from the start a definite part

of the program. The real development of this service, under larger appropriations, stands to the credit of Charles S. Judd.

The second main line of work of the Division of Forestry, in the earlier years, was the kind of tree planting noted above, under 2—experiments with trees of value for lumber and other uses. In that no conifers are found among the indigenous trees of Hawaii, dependence for practically all the heavy construction timbers used in the Territory is still placed, even to today, on redwood and Douglas-fir imported from California and the Pacific Northwest. The need for a local lumber supply continues urgent.

To provide for minor timber needs on the plantations and the ranches, as for posts, ties, bridge timbers, etc., trees from some other subtropical countries have proved satisfactory, especially certain eucalypts from Australia. In 1904 the government nursery, instead of growing ornamental, flowering trees, was set to producing such timber tree species for sale and distribution. With this went a campaign to aid and cooperate with the sugar plantation companies in tree planting on non-agricultural lands, or on gulch sides, or other waste areas.

In direct charge of the propagating work was David Mitchell Haughs, forest nurseryman, a Scot from Glasgow, who rendered notable service to the people of Hawaii, from 1893 to his retirement in 1929. There was no question that "Davy" had a green thumb. A large part of his work was to experiment with species new to Hawaii, to determine their value for use under varying conditions and at different elevations.

A contribution by the U. S. Forest Service to the experimental tree planting work was the detail from Region 5, California, for three months in 1910 of Louis Margolin to make a study of "Eucalyptus Culture in Hawaii." This was published as Bulletin 1 of the Division of Forestry in 1911.

Another Forest Service grant-in-aid in 1911, made at Hosmer's request, was to test the possibility of growing certain coniferous timber species from the mountains of California on the upper slopes of Mount Haleakala (10,030 feet) on Maui, and on Mauna Loa (13,675 feet) and Mauna Kea (13,825 feet) on Hawaii, between the elevations of 7,000 and 11,000 feet, above the belt of trade-wind rains. These plantings were made in cooperation with two of the largest cattle ranches in the Territory. Counts and measurements made twelve years later, by C. S. Judd and C. J. Kraebel showed that enough individual trees had come through, and grown, and were producing fertile offspring, to justify the experiment. The tests were thereupon continued and enlarged.

Only a very few indigenous trees have commercial value, except locally for cabinet work or veneer wood. Koa (*Acacia koa*) is best known. Most other native trees are primarily of botanical interest, except those that make up the rain forests. Of these ohia lehua (*Metrosideros polymorpha*) is the most important. But in this connection mention may be made that Dr. Joseph F. Rock was, from 1908 to 1911, a member of the Division of Forestry staff as consulting botanist. He was transferred to the University of Hawaii, from 1911 to 1919, prior to his notable botanical explorations of China and Tibet. In 1913 was published in Honolulu, by patronage, his richly illustrated book *The Indigenous Trees of Hawaii.*

In May 1908 forester Hosmer was invited by Governor Walter F. Frear to accompany him, as one of his conferees, to the Conference of the Governors called by President Theodore Roosevelt at the White House. Upon their return, Governor Frear appointed Hosmer chairman of the Conservation Commission of Hawaii. In March 1909 the Governor and members of that Commission appeared before the Legislature of Hawaii to discuss conservation in its relation to the Territory. Bulletins carried the speeches, in English and in Hawaiian.

The work of the Division of Forestry has always had the support of favorable public opinion. Three earlier presidents of the Board—Lorrin A. Thurston, Walter M. Giffard and Colin G. Lennox—stand out as having undertaken, personally, to make special studies of forest management for water conservation in Hawaii for presentation in biennial reports.

From 1915 to 1939, Under Charles S. Judd

The particular accomplishments made by Judd were, first, to complete the legal organization of the forest reserve system; second, to secure the efficient fencing of a large percentage of the forest reserve boundaries, and by means of cattle drives and by hunters, to go a long way toward ridding all the reserves of wild stock. Third—and his major professional contribution—was, by extensive plantings, to bring the forest reserve areas on the watersheds into their full status as true protection forests of an approved rain forest type. It was to this last task that he gave the later years of his life.

When in 1931 the aggregate total area of the forest reserves reached 1,021,314 acres, Judd was happy to announce, in an article in the JOURNAL OF FORESTRY (Vol. 29, No. 3, p. 363): "This amounts to almost exactly 25 percent of the total land area of the Territory, and is considered none too much to assure the growing population of a continuous and efficient water supply."

As to the progress of forestry in the Territory he then said: "Since the inception of forest work in Hawaii, the force to carry on field operations has gradually been built up, with appropriations made by a favorably inclined legislature, until now the Territorial Forester has four trained assistant foresters—one on each of the four main islands; eighteen forest rangers; 29 workers in the four tree nurseries; and 35 tree planters." (Later the title Assistant was

changed to "Associate Forester.")

Further contributions by C. S. Judd.—Judd often used novel ways to get things done. One, in 1926, was to sow tree seeds from an airplane on extremely rough "aa" lava flows on the island of Hawaii which had been burned over. About 700 pounds of seed were so distributed. On an earlier occasion Army airplanes had dropped tree seed on denuded mountain slopes on the island of Oahu, at his request.

When national parks were established in Hawaii in 1920 Judd was quick to cooperate with the park officials. He was a regular contributor to the JOURNAL OF FORESTRY and spoke frequently before local associations on subjects that had to do with forestry and with conservation.

During the 1920's Judd, assisted some of the time by Charles J. Kraebel, offered courses in the elements of forestry at the University of Hawaii. These were intended for men who might consider field employment in the Division of Forestry. In his later years Judd led a movement further to safeguard the Honolulu watershed on Oahu through the acquisition by the Territory of the private lands in that forest reserve. With increasing population this continues to be a present day problem.

In the 1920's Charles J. Kraebel (Michigan) and T. C. Zschokke (Yale) served, in turn, as assistant superintendent of forestry. Max F. Landgraf, now associate forester for Oahu, started as a ranger in 1924. Walter W. Holt (University of Hawaii) was named to succeed David Haughs as forest nurseryman on the former's retirement in 1929. Holt followed Crosby, on Maui, in 1939.

Charles S. Judd died in Honolulu, June 29, 1939.

Reforestation of the Forest Reserves

The restoration of a rain-forest type of vegetative cover on the watershed reserves presented serious difficulties. So much of the original endemic rain-forest had been incurably injured or totally

WALTER W. HOLT

destroyed by decades of grazing that the problem had become, in many localities, one of replacing the former cover by a new botanical association of trees, undergrowth, and surface plants able to function in a way similar to that of the old forest. Many exotic plants, new to the Territory, were demanded. To secure and bring these to Hawaii, and to establish them, required botanists as well as foresters.

Once more the Hawaiian Sugar Planters Association came into the picture. Through the years the planters have often benefitted by using specialists for the solution of comparable emergencies. This time the Planters Association authorized its experiment station to cooperate with the Territorial Board of Agriculture and Forestry by setting up a "Department of Botany and Forestry," under its forest pathologist, Dr. Harold Lloyd Lyon, with a staff of botanists, for a 20-odd year period, from 1918 to about 1940. These men introduced, germinated, propagated, and tested thousands of species of plants of the needed sorts at special nurseries and in trial areas until sufficient material was provided and made ready for the permanent plantings.

All during this period the most intimate cooperation was maintained between forester Judd and his territorial staff, and botanist Lyon and his men. The resulting program led to marvelous team play in the actual reforestation of the forest reserves.

So firm was the belief of the Sugar Planters Association in this conservation undertaking that the entire cost of the Department of Botany was borne from the funds of the H.S.P.A. Experiment Station. This shows, as nothing else could, the integration of the sugar industry with the economic life of the Territory of Hawaii.

Two botanists who worked with Dr. Lyon were Lester W. Bryan, on Hawaii, and Albert W. Duvel, on Kauai. Both later became associate foresters for the Territory. Since 1922 Mr. Bryan has been resident on the Island of Hawaii, keeping close track of all forestry introductions, including commercial timber tree species, as well as plant material primarily of value for watershed planting. His invaluable records and conclusions are given in his brochure "Twenty Five Years of Forestry Work on the Island of Hawaii," (reprinted from *The Hawaiian Planters' Record*, Vol. 51, No. 1, 1947.) That reprint also carries a 3-page summary by Dr. Harold L. Lyon: "Facts of Great Importance." This likewise is significant. More about the general program is to be found in Dr. Lyon's article, "Ten Years in Hawaiian Forestry," (Planters' Record, Vol. 33, No. 1, 1929.)

From 1939 to 1955, Under William Crosby

From working a dozen years with Judd on some of the most difficult phases of the forest problems of Hawaii, Crosby was in good position to take over and carry on the broad forest policies of the Territory. In connection with the forest reserves he continued the standardized practices of keeping the boundary fences in order, of constructing roads and trails, and of expanding the forest planting work when appropriations were available. Until 1941 he had the advantage in each of these activities of the C.C.C.

It is said in the 1952 report of

the Board that "the Civilian Conservation Corps accomplished a reforestation program in eight years that would have been equivalent to forty years of work under normal Territorial appropriations." Similar statements were true on the Mainland, but in Hawaii the time at which this aid came was peculiarly apt, for much of the C.C.C. work was in restoring "rain forest" cover.

With the end of the C.C.C. in 1941, and the coming of World War II, the Board was obliged to discontinue most of the forest cover planting in the watershed reserves. Certain statistics are available in the Board's biennial reports but here this subject may well terminate with this note from a letter to the writer from Ex-Territorial Forester William Crosby, written in August 1958: "Our C.C.C. operations (1933 to 1941) covered a very large portion of the important watershed areas on the major islands."

In addition to the watershed plantings in the forest reserves Crosby was sympathetic to and interested in the experimental planting of timber tree species on other lands, particularly of conifers at considerable altitudes on the high mountains. One example, between 6,000 and 7,000 feet, in the Kula Forest Reserve on Maui, is a plantation of the coast redwood from California, started from seed in 1932 by Judd. Twenty years later this stand, grown under Crosby's care, had trees 60 feet tall and up to 30 inches in diameter. Other plantations of redwoods are also growing well on the Kona Coast on Hawaii, on Bishop Estate lands, where the subsurface is so porous that there are no running streams.

Like his predecessors, Crosby exercised administrative jurisdiction over the forest reserves, including recommendations which led to additions or reductions in area, or changes in the location of boundaries. To show what the essential figures were after almost half a century, the aggregate area of all forest reserves in 1952 was 1,065,194 acres, of which 65 percent was owned by the Territory in the 64 reserves.

Crosby brought the task of ridding the reserves of wild stock to a point where the number remaining had been reduced to the natural yearly increase, which can be controlled by local sportsmen's clubs under hunting licenses.

One of his last reports to the Board, made in 1954, contains a clear restatement of the principles on which the forest reserve system had been handled steadily for 50 years.

Upon his final retirement on June 30, 1955, Crosby was succeeded by Walter W. Holt, as territorial forester. Holt in turn was followed as associate forester on the Island of Maui by Karl H. Korte. Both men continued to hold these positions in 1957, as did also the other three associate foresters: Max F. Landgraf, Oahu; Lester W. Bryan, Hawaii; and A. W. Duvel, Kauai. Also in that year, Albert J. MacDonald, Thomas R. L. McGuire and Tom K. Tagawa are listed as foresters on Oahu.

William Crosby continues to maintain his home in Honolulu.

A Postscript

The more important historical facts as seen by an old timer are here set forth. The task is completed but the story as a whole must go on, for forestry is essential to Hawaii, be it a Territory, or a State.

Now, because there have been other new happenings during the past three years—1956 to 1958—this writer cannot refrain from adding a brief note, as of today, just to call attention to them.

On July 16, 1956, Mr. C. Eric Reppun became president of the Hawaiian Board of Agriculture and Forestry. In the annual report for the fiscal year July 1, 1956 to June 30, 1957 (pp. 90-91) is the statement: "Realizing the need for a more positive, progressive and realistic forestry program in the Territory in order to assure greater future utilization of our forest potential, and at the same time more adequately to safeguard our critically important watersheds, the Board, in November of 1956, initiated extensive negotiations with the U. S. Department of Agriculture Forest Service to seek further Federal assistance."

This was particularly in the way of a request for a Forest Service research center for Hawaii, with a program to include research in a forest inventory, in forest management, in timber utilization, and in watershed management.

Personal conferences by President Reppun, in September 1957, with officials of the Forest Service in Washington, D. C., at the Forest Products Laboratory in Madison, Wisconsin, at the Headquarters of Region 5 in San Francisco, and at the California Forest and Range Experiment Station in Berkeley, California, led to assurances of support.

As one result, Eugene V. Russell, chief, Division of Economics of the California Forest and Range Experiment Station was given an initial assignment to visit Hawaii to start a forest survey. This he did in January and February 1957. His report, in April 1957, recommended the establishment of a Forest Service research center and a research program for Hawaii. A subsequent step was the shipment of the first lot of logs of Hawaiian grown timber species to the Forest Products Laboratory at Madison for testing, in October 1957.

In addition to these federal contacts a Territorial grant was secured in September 1956, from the Economic Planning and Coordination Authority of the Territory, to permit Lester W. Bryan, associate territorial forester for the Island of Hawaii, with an official companion, Mr. Myron L. Wold, to make an investigational tour that autumn to Australia and New Zealand, to observe, in their native localities, species of eucalyptus trees which have been introduced into Hawaii during the past 70 years and are now extensively planted, especially on the Island of Hawaii. As this comes under the Board's new project "Exploitation of Hawaii's Timber Resources," it

included studies of the forestry and timbering techniques that have proved most efficient in those countries. A 100 page illustrated report, prepared by Bryan and Wold, was published by the Board of Agriculture and Forestry in January 1957.

During the summer of 1958 other Forest Service men were in Hawaii. First John R. McGuire, head of the forest economics research division at the California Forest and Range Experiment Station, was on a mission to start a five-year Territorial timber survey. Then, also from the California Station, Robert E. Nelson was assigned to head the survey. A forester from the Territorial staff, Tom K. Tagawa, will work with him.

From these items it is evident that forestry in Hawaii is expanding in a variety of directions. It will be appropriate if these new developments coincide with the coming of Statehood to Hawaii.

Bibliography

1. BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY, TERRITORY OF HAWAII. 1904-1956. Biennial reports. (Some illustrated.)
2. ————. *The Hawaiian Forester and Agriculturist.* 1904-1933. (A monthly magazine published by the Board from January 1904 to March 1933.) Vol. 1 to 29. (Carried official reports and descriptive articles.)
3. ————. Conservation of Hawaii's natural resources. 1909. Addresses before the Legislature of the Territory of Hawaii, Session of 1909, by the Governor and his Conferees who attended the Governors' Conference with the President in Washington, D. C., May 1908, and by others. 21 pp.
4. BRYAN, LESTER W. 1947. Twenty-five years of forestry work on the Island of Hawaii. Reprint from *The Hawaiian Planters' Record* Vol. 51, No. 1: 1-80.
5. CROSBY, WILLIAM. 1953. Forestry in the 49th state. *American Forests* 59 (7): 20-22, 43-45. Illus.
6. HALL, WILLIAM L. 1904. The forests of the Hawaiian Islands. Bul. 48, Bur. Forestry, U. S. Dept. Agric. 29 pp. Illus.
7. HOSMER, RALPH S. 1913. Experimental forest planting in the Hawaiian Islands. Proc. Soc. Amer. Foresters Vol. 8, No. 2: 211-221.
8. JUDD, CHARLES S. 1931. Forestry in Hawaii for water conservation. Jour. Forestry 29: 363-367.
9. ————. 1935. Forestry in Hawaii. Jour. Forestry 33: 1005-1006.
10. LYON, HAROLD L. 1929. Ten years in Hawaiian forestry. Reprint from *The Hawaiian Planters' Record* Vol. 33, No. 1: 55-97. Illus.
11. ————. 1947. Facts of great importance. *The Hawaiian Planters' Record* Vol. 51, No. 1: Inside Cover.
12. MARGOLIN, LOUIS. 1911. Eucalyptus culture in Hawaii. Bul. No. 1, Div. Forestry, Terr. of Hawaii. 80 pp. Illus. (In cooperation with U. S. Forest Service.)
13. REPPUN, C. ERIC. 1957. Annual report of the Board of Commissioners of Agriculture and Forestry, Territory of Hawaii, July 1, 1956 to June 30, 1957.
14. ROCK, JOSEPH F. 1913. The indigenous trees of the Hawaiian Islands. 518 pp. Illus. Published under Patronage, Honolulu, Hawaii.

The cover.—This photograph from the files of the U. S. Forest Service bears the following inscription: "Experimental Garden, Makiki Valley, Honolulu. Here are propagated for trial and distribution trees of economic value new to the islands." No date is given. Professor Hosmer, whose article (page 83) tells of the early days of forestry in Hawaii, after viewing the photograph advised "I have the correct year when the Makiki Station was enlarged, 1911, and the photo taken, by botanist Joseph F. Rock."

The Consumer's Attitude Toward Lumber in Exterior Walls of Houses[1]

Joseph Zaremba

MANY FORESTERS and lumbermen in the United States fear that lumber will continue gradually to lose its markets to competing materials. They point to the rapid rise in lumber prices that has occurred during the past several decades, particularly since World War II.

There is substantial evidence that the lumber-price trend will continue upward and may even become steeper.[2] There is an urgent need, therefore, to examine the validity and seriousness of this alleged uncertainty of lumber's future.

It goes without saying that an increase in the price of lumber, with all other factors that influence demand (mainly income, population, and preference) remaining constant, results in a decrease in quantity demanded by consumers. In our rapidly changing economy, however, the non-price factors do not remain constant. Indeed, expanding incomes and population and changes in preference have resulted in a progressive increase in lumber demand over the years, largely offsetting the adverse effect of high prices on total consumption.

The tendency for the non-price factors to enlarge lumber demand is easily verified. Since the early 1930's lumber prices increased fivefold (the prices of most competing materials about doubled). But lumber consumption also increased, and the total now stands slightly under the all-time high of 1909. In the presence of such a great price increase, this level of consumption could have occurred only with a substantial increase in lumber demand itself.

Will the non-price factors continue to counteract the adverse effect of rising prices in the future? Expanding incomes and population will certainly continue to exert an upward pressure on lumber demand. Nothing definite can be said, however, about the influence of consumer preference on lumber demand in the future. This article will attempt to show that strong preferences for various kinds of building materials have had a powerful stabilizing influence on lumber consumption in home construction, the greatest single use for lumber. But whether preference will continue to exert this stabilizing influence in the future with rapidly rising prices, or whether it will exert an upward or downward pressure on lumber demand, will depend to a large extent on how successfully the consumer's attitude toward wood can be improved and maintained.

This analysis shall proceed along a somewhat indirect route insofar as scientific investigations go. First, attention is focused on the marked geographic differences in the use of building materials for exterior walls of dwellings. Then it is shown that these differences are chiefly the result of geographic differences in the attitudes of people toward construction materials. This is the main empirical evidence in support of the argument that consumer preference is often the dominant factor underlying the use of materials in homes. Finally, the underlying basis of consumers' attitudes toward construction materials is examined and a few words said about the steps that might be required to maintain a favorable attitude toward wood.

Geographic Variation in Material Use

About 80 percent of newly-built dwellings in the United States have frame-exterior walls with brick veneer, asbestos shingle, or wood exteriors; the remaining houses have walls of solid masonry. In northeastern United States masonry is found primarily in a narrow zone extending from Philadelphia, Pennsylvania to Norfolk, Virginia. Elsewhere in this part of the country virtually all houses have frame walls with wood exteriors, chiefly wood shingles and clapboard.

There seems to be no general agreement why geographic differences in the use of materials exist. Some maintain that these differences are the result of geographic variation in building-material prices. Accordingly, one often hears that the abundance of masonry near Philadelphia is due to the relatively low price of brick there. But prices of building materials are fairly uniform throughout the Northeast. The minor variations that exist can hardly account for the differences in consumption.

Fire insurance rates, another factor mentioned frequently to explain the predominance of masonry in the Philadelphia area, are about two cents (per $100 valuation) higher on frame dwellings than on masonry; but because masonry houses are more costly, they are given a higher evaluation. Thus, the advantage to masonry construction is very small — too small to cause much of a tendency toward this type of construction. Furthermore, insurance costs would certainly not explain the widespread use of wood exteriors throughout most of the northeast.

Building codes prohibit the use of wood in certain sections of cities. But virtually all single-family

THE AUTHOR is assistant professor, State University College of Forestry at Syracuse University, Syracuse, New York.

[1]In this article is presented a portion of the findings of a study in wood consumption by the construction industry. It is based on a thesis submitted to Harvard University in partial fulfillment of the requirements for a Ph.D. degree in economics. The field work was supported by a grant from the U. S. Forest Service.

[2]Zaremba, J. The trend of lumber prices. Jour. Forestry 56:179-181. 1958.

houses throughout the country are now being built in the outskirts of cities or in rural areas where building ordinances permit free choice of materials for the walls. Hence where masonry is used in new dwelling construction, such use cannot be attributed to building code requirements.

The scarcity of masons is suggested as a reason for the absence of brick houses in certain localities. However, should an effective demand for these houses arise, it can be assumed that such labor would migrate into these areas, or that local labor would take up the trade.

Interview Procedure

To determine, then, what actually causes people in different areas to adopt different materials for exterior walls, a consumer interview survey was made in Delaware County (near Philadelphia) in 1954, and also one in New Haven, Connecticut, in 1955. In the former area most newly-built dwellings have exterior walls of solid masonry—mainly brick veneer against concrete-block backup. The substitution of masonry for wood in the walls reduces average wood requirements by about 3M board feet per house. In the latter area virtually all houses have frame walls with clapboard or wood-shingle exteriors.

Since the survey in Delaware County was intended only as a pilot study, a true random-sampling technique was not employed in the selection of consumers. Instead, an attempt was made to interview families from a variety of circumstances spread over a wide area. The sample, somewhat biased toward both low and high income households, consisted of 96 families who had purchased new houses within the previous two-year period. The New Haven sample consisted of 100 families, selected randomly, who had purchased houses during the same period.

The characteristics of the Delaware County sample are indicated by the following frequency distributions:

Annual Incomes ($1000)

Income*	under 4	4-5.9	6-7.9	8-9.9	10 and over
Number families	17	44	17	9	8

*The income of one family is unknown

Price of House ($1000)

Price	under 10	10-11.9	12-13.9	14-15.9	16-19.9	20 and over
Number families	10	33	14	17	7	15

Exterior Walls

Type	frame	masonry
Number families	28	68

Number Stories

Stories	1	1½	2
Number families	19	43	34

The characteristics of the New Haven sample are as follows:

Annual Income ($1000)

Income	under 4	4-5.9	6-7.9	8-9.9	over 20
Number families	20	30	16	12	22

Price of House ($1000)

Price	under 10	10-11.9	12-13.9	14-15.9	16-19.9	over 20
Number families	3	23	24	13	13	24

Exterior Walls

Type	frame	masonry (incl. br. ven.)
Number families	96	4

Number Stories

Stories	1	1½	2
Number families	53	30	17

Each interview lasted about one-half hour. The homeowner was asked what his choice of material would be if he were given the opportunity for choice. He was also asked to indicate the reasons for his choice.

Some homeowners cited as many as four reasons for preferring a specific material for exterior walls; the average was two reasons.

Interview Findings

Delaware County.— Four homeowners interviewed in Delaware County preferred frame exterior walls; while 92 preferred masonry. Consumers were quite definite and frank about their preferences. The reasons for the strong attachment to masonry are listed in Table 1, where similar answers are grouped and expressed as a percentage of all answers.

Homeowners believe that masonry can withstand the climatic elements more effectively than wood. They have a keen interest in avoiding both the cost and the bother of upkeep on wood exteriors. Moreover, masonry is non-combustible and does not decay. Indeed, a masonry house suggests something sturdy and long-lasting to Delaware County consumers.

Although a well-constructed frame wall is a good insulator against the outside weather, many homeowners believe that masonry walls are better.

The four homeowners who preferred frame walls expressed much interest in working with wood.

New Haven. — Eighty-three of the homeowners interviewed in New Haven preferred wood-exterior houses, and 17 would rather have masonry (or brick veneer on frame). Their reasons for preferring wood are listed in Table 2. Homeowners dislike the appearance of masonry because it reminds

TABLE 1. — HOMEOWNERS' REASONS FOR PREFERRING EXTERIOR WALLS OF MASONRY—DELAWARE COUNTY

Reason	Percent of answers
Requires less maintenance	66
Superior insulation qualities	13
Low fire hazard	9
Pleasing appearance	6
Resistant to termite attacks	4
Miscellaneous	2
	100

TABLE 2. — HOMEOWNERS' REASONS FOR PREFERRING WOOD-EXTERIOR HOUSES —NEW HAVEN

Reason	Percent of answers
More pleasing appearance	47
Permits changing the outside color	21
Superior insulating qualities	14
Owner can do own repairing	11
Easy to keep neat outside	7
	100

TABLE 3. — HOMEOWNERS' REASONS FOR PREFERRING EXTERIOR WALLS OF MASONRY—NEW HAVEN

Reason	Percent of answers
Greater durability	46
Less maintenance work	38
Superior insulating qualities	12
Low fire hazard	4
	100

them of something "cold," such as a factory or commercial building. Several mentioned that masonry would look "out of place" in a community of predominantly wood houses.

Although owners of wood-exterior houses value the opportunity to change the outside color, it seems that a great many repaint their homes the same color. Apparently the important consideration is that owners of wood houses are free to change color while owners of masonry houses do not have this freedom.

The attitudes toward masonry on the part of the 17 New Haven homeowners who preferred this material seem to be about the same as those of the Delaware County homeowners (Table 3).

Analysis of Results

These data represent what people in two small areas are thinking about wood and masonry for exterior walls. It is reasonable to assume, however, that the data for Delaware County are fairly representative of attitudes throughout the masonry zone referred to previously; the data for New Haven might similarly represent attitudes throughout the remainder of the Northeast where wood-exterior houses predominate.

The opinions of some homeowners are contradictory. Some insist, for instance, that masonry is superior to wood as an insulating material, while others in the same locality maintain that wood is superior to masonry. These opinions are, nevertheless, relevant because what motivates a person is not necessarily the truth (or what other people think is the truth) but what he himself thinks is right.

Two important and somewhat related findings emerge from this survey. The first concerns the high correlation between preference and ownership of construction material, and the second concerns the intensity of preference for materials.

Correlation between preference and ownership — There exists a fairly close agreement between the types of materials that consumers have (or own) and those which they prefer. In Delaware County virtually all consumers prefer masonry, while about 83 percent of newly-built dwellings have walls of this material.[3] In New Haven 87 homeowners interviewed from a random sample of 100 preferred wood exterior houses, and 96 of these homeowners were found with houses of this material.

This pattern of consumer preference and behavior can be better understood if the relationships existing between builders and house buyers are examined. It is widely believed that builders construct dwellings as they prefer and are therefore in the strategic position of determining consumption patterns and trends, consumers ultimately adopting the tastes and preferences of builders. But is this so?

It is true that builders, like most manufacturers, strive through salesmanship to induce buyers to adopt their product. In fact, in the short term, consumers are dominated by builders (or the market) in the sense that choices are limited to what is being offered. In the longer run, however, home buyers are not dominated by the decisions of builders, for the building trade is highly competitive and an overlooked or neglected preference will, in time, be discovered. Builders must, therefore, use the types of materials which are most preferred by consumers.

Builders in Delaware County keep abreast of preferences by occasionally constructing "model" houses of different materials and styles (including well-built frame houses) near the development area. Production plans are based on the degree of home-buyer interest in such houses. The public, however, for the most part shows only slight interest in wood exteriors, and even the "model" houses of this material have usually had to be sold at prices below cost.

The desire for conformity may explain why nearly all consumers in one area express a preference for the same material. Individuals, particularly those with low incomes, are known to be motivated in many purchases by the desire to maintain or to achieve social status. However, the consumers interviewed did not seem to purchase dwellings of a certain material merely to conform to an established pattern since not one homeowner in Delaware County mentioned this factor and in New Haven only four mentioned it. It is, of course, entirely possible that the pull of conformity is so subtle that it is beyond detection by the research methods employed here.

Thus builders may strive to induce buyers to adopt new materials, but they proceed cautiously and meet with varying degrees of success depending on the relative merits of materials as seen by consumers. The close agreement be-

[3] A mail survey of building permit centers covering nearly all houses built in the County during 1954 revealed that 83 percent have exterior walls of solid masonry, while 17 percent have frame walls with brick veneer, clapboard, or asbestos shingle exteriors.

tween the materials which people have in the walls and those which are preferred suggest, more than anything else, that builders are fairly successful in meeting home buyers' preferences.

Intensity of preference — The second important finding of the survey concerns the intensity of preference for wood and masonry.

The range in annual family income of the Delaware County sample is 2 to 46 thousand dollars. There is no significant difference in attitudes among families of different incomes. There is, however, a distinct variation in materials used for exterior walls between high- and medium-income families and those with the lowest incomes. Frame houses, being about 15 percent cheaper than masonry houses of equivalent size, are found mostly among the lowest-income families. But one is impressed with the interest and indeed the anxiety of these families to change to masonry at the earliest opportunity.

This observation, together with our knowledge of attitudes, seems to explain why masonry is used extensively for exterior walls in Delaware County. Consumers have a strong desire (or preference) for the attributes of masonry. Indeed the preference for this material is so dominant that all but the lowest-income families are found living in houses of this material.

In New Haven, on the other hand, even the high-income families do not, in general, have masonry houses. Homeowners show scarcely any interest in this material. Here we find a prevailing preference for wood-exterior houses.

Hence within a relatively short distance there is a complete turnabout in preferences for materials in exterior walls. This reversal in preference seems to be the main cause of the observed difference in material use.

Past Experiences

The people in Delaware County, then, have a greatly different opinion of construction materials than those in New Haven. Perhaps in no other area of consumer expenditures are there such vast differences among consumers.

What is the basis of such attitudes among homeowners? The answer may be found in experiences of consumers with construction materials. Often past experience is the basis for an individual's judgment and response.

In Delaware County long tradition in the use of masonry has conditioned consumers to associating masonry with quality and satisfaction. Even today frame construction is, in general, inferior to masonry construction. In one housing development it was noticed that the shingles were installed with insufficient spacing. After a while, shingles on many houses began to buckle and soon some were forced off the wall. In another development, the construction was so poor that daylight could be seen through openings in the walls. Many homeowners recalled troublesome experiences repairing deteriorated clapboard houses, decayed windowsills, and "sticky" windows in previously owned houses. Such experiences can be expected to create an unfavorable impression and to cast doubt in the consumer's mind upon the future preformance of wood.

It would be a mistake to think that all frame construction in the County is inferior. Nevertheless, the fact that many people gain their early experience with construction materials in low-cost houses emphasizes the important role of lumber quality and building techniques in shaping attitudes.

One of the most discouraging effects of inferior construction is that it gives many homeowners the impression that low-grade lumber, rather than workmanship, is the main cause. Furthermore, it is generally felt that the quality of lumber will not improve substantially in the future since, in the opinion of many consumers, the forests of America are deteriorating.

In New Haven, on the other hand, the quality of frame construction is, in general, superior to that in Delaware County, particularly in the low-income housing developments. Although the quality of brick construction compares favorably with that in the Delaware County area, the brick walls of some commercial buildings and residences have developed white discolorations which many people consider unsightly.

The close connection between quality and preference is further revealed in the findings on kitchen cabinets. All homeowners having the high-grade kitchen cabinets, such as those of knotty pine, prefer wooden cabinets. But many have become disappointed in low-grade painted wooden cabinets and have expressed a perference for metal.

This suggests that builders could create a favorable attitude by offering a product superior in materials and workmanship. In the past when a strong preference for wood has been replaced by a strong preference for non-wood material, a permanent loss to the lumber industry has usually been the result. However, wood may succeed in recapturing lost markets and in making secure those markets that it now holds through advertising and trade promotion, provided quality is also improved and maintained.

Besides direct experiences with construction materials, the lack of any experience at all seems to influence homeowners' thinking. Many have never lived in wood-exterior houses and therefore have no true basis for comparison. Since they have no serious objection to masonry, they are reluctant to adopt an unfamiliar material. Incidentally, many consumers in both areas who lacked experiences with a material were disposed to explain their preference by citing observations of material use outside the house or the experiences of relatives and friends.

Conclusions

The two main factors which underly consumers' choices of construction materials are the price and non-price influences. One of the latter is consumer preference. If the lumber-price trend continues its upward climb, maintaining a favorable consumer attitude toward wood products will become a key problem in preserving and enlarging lumber's traditional markets.

In the long run, the most effective means of creating a favorable impression in consumers' minds is to offer them wood products of superior quality and workmanship. Expenditures for trade promotion and advertising alone, while very useful and necessary, are not sufficient. Wood products must be of a quality sufficient to fit the needs and capture the tastes of consumers better than products made from non-wood materials.

Leader Forking of Red and White Pines in Plantations[1]

Robert A. McCabe
and Ronald F. Labisky

THE BEAUTY as well as the commercial value of our native pines is dependent on straight and upright boles. One of the chief factors which operates against normal growth is loss of leader dominance resulting in forked trunks.

This paper presents the results of an investigation of this forking phenomenon in the pine plantations on the University of Wisconsin Arboretum (1,200 acres, Madison, Wisconsin).

On this area three major plantations comprising about 100 acres were given over to mixed stands of red (*Pinus resinosa*), white (*P. strobus*), and jack pine (*P. banksiana*). All were planted between 1936 and 1951. Not long after the pine plantations were established forking became evident. No obvious causative agent was apparent. This tendency has been observed frequently by others under similar circumstances (*3*). A recent paper (*9*) reports summer shoots in a red pine plantation in New York state observed as early as 1933.

Study Plots

The two Arboretum study plots to be reported on here were planted at different times. Plot *A* was planted in May 1943 and 1944 when 1,700 red and white pines of 2-2 and 2-3 stock were set out. After 13 years the survival is about 40 percent. This is not a row plantation but one that simulates natural tree distribution in a forest.

In Plot *A*, about 1,000 trees were set out in 1943. One year later, 86 trees were dead and about 12-15 were dying. Thus in the first year the loss amounted to about 10 percent. Most of the losses were due to improper planting. In 1944, it was obvious that a large number of the newly planted pines were forked.

Plot *B* is a five-acre addition to an established plantation which is now about twenty years old. The study plot was hand planted to 2-2 red and white pines in 1951.

Plot Checking

In 1956, Plots *A* and *B* were sampled for the incidence of forking. All the trees in Plot *A* were examined. If a pine was fork tipped, the year of the forking was determined by counting the number of internodes along the bole from the leader to the fork. In Plot *B*, the first 200 pines of each species encountered in a 30-foot strip across the plantation were similarly measured.

Plot Findings

The results of the tally for Plot *A* are shown in Table 1. This plantation, now 13 years old, showed 46 percent forking in red pine, 22 percent in white pine. The difference here is highly significant. However Plot *B* (Table 2), on the heavier soils and with its younger trees, showed an opposite condition, where 21 percent of the white pines was forked against 10 percent of the red pines examined. J. R. Beer[2] working on the latter site in 1945 in the older section of the plantation of which Plot *B* is a part, also found "a higher percent of the white pines (88 percent) affected than of the red pines (84 percent)." Unfortunately, he did not report the total number of each species examined. Halazon[3], in several Wisconsin plantations found that of 166 planted red and white pines, 33 percent was forked, as against no forking in 65 wild pines of comparable age.

Honey (*6*), on the contrary, found "forking or multiple forking" in 38 percent of 1,799 white pines from 12 Wisconsin sites and 57 percent forking in 237 trees in three natural stands.

Carvell reports (*3*) that 19 percent of the red pine plantations in West Virginia had summer shoots. He states further that in 1955, 76 percent of these trees having produced summer shoots in 1953 had a permanent fork in the bole. This is a relatively low incidence of forking. Jump (*8*) recorded fork-

THE AUTHORS are professor and research assistant, Department of Forestry and Wildlife Management, University of Wisconsin, Madison.

[1]Journal paper No. 38, University of Wisconsin Arboretum.

[2]Unpublished report, Dept of Botany, Univ. of Wis., 1946

[3]Unpublished report, Dept. of Botany, Univ. of Wis., 1942

ing in 63 to 94 percent of the red pines in eight sample plots in the Rochester watershed in New York.

These studies are examples of the abundant evidence that forking is a common if not a serious forestry problem.

Discussion

There have been several attempts made to record and appraise the incidence of forking in plantations of red and white pines by various students on the University of Wisconsin Arboretum. In each case the observer hoped but failed to point up a causative factor.

Forking appears to be caused by one or more of the following:

1. Precocious development of the lateral buds in the terminal cluster. Honey (*6*) calls this *prolepsis* or the premature development of buds into branches. Büsgen (*2*) and Carvell (*3*) refer to this phenomenon as "summer shoots" or "lammas shoots." The lateral shoots, which grow prematurely, develop as if the terminal bud were completely absent, and assume a vertical position. In the following growing season the leader must then compete at a disadvantage with the lateral shoots which had commenced to grow during the previous summer. If the leader does not regain dominance, the result is generally a forked tree. The mechanism behind lammas shoots as postulated by Büsgen (*2*) and Carvel (*3*) is the stimulation of lateral buds by late summer rains following a prolonged dry period during which growth has virtually stopped. The terminal bud, which normally produces auxins to prevent the laterals from competing with the leader, is apparently unable to do so during this period of lammas growth. Just how the auxin balance is disrupted in summer shoot development is not known.

2. Jump (*8*) points out that extra seasonal elongation of lateral buds while the terminal bud is dormant causes minute fissures in the area of the forking. Several fungi (*Tympanis* spp. and *Dematium pullulans*) enter the fissures and grow in the living tissue. *D. pullulans* was found to produce a growth-promoting substance. He therefore postulates that this phytohormone causes abnormal bud growth resulting in forking. This hypothesis should not be difficult to test, but the authors know of no research which has done so.

3. The possibility that forking is inherited was suggested by Honey (*6*). The tests run in this study indicate that those trees that were pruned to eliminate one of the leaders in a fork showed no greater tendency to fork in subsequent years than did the trees which had no fork. Of 275 17-year-old red pines, only 7.3 percent showed multiple forking, and 4.5 percent occurred in 337 white pines of the same age. If the tendency for forking in red and white pines is genetic, the studies in Wisconsin were unable to detect it.

4. Any damage to the terminal bud or growing leader could cause it to cease growing and allow undamaged laterals to compete for dominance. Injury could be caused by animals such as white-tailed deer (*Odocoileus* spp.) and rabbit (*Sylvilagus* spp. and *Lepus* spp.) browsing, pine grosbeak (*Pinicola enucleator*) damage to buds, or breaking of leaders by roosting crows (*Corvus brachyrhynchos*). Insects such as the white-pine weevil (*Pissodes strobi* [Peck]), European pine shoot moth (*Rhyacionia buoliana* [Schiff.]), and Nantucket

TABLE 1.—INCIDENCE OF INITIAL FORKING IN A SAMPLE OF 275 RED AND 337 WHITE PINES (16 AND 17 YEARS OLD)—PLOT A

	Red pine		White pine		Combined	
	Number	*Percent*	*Number*	*Percent*	*Number*	*Percent*
1940	—	—	4	1.2	4	.7
1941	—	—	4	1.2	4	.7
1942	6	2.2	3	.9	9	1.5
1943[1]	9	3.3	4	1.2	13	2.1
1944[1]	1	.4	1	.3	2	.3
1945	2	.7	—	—	2	.3
1946	—	—	—	—	—	—
1947	—	—	1	.3	1	.2
1948	2	.7	1	.3	3	.5
1949	4	1.5	1	.3	5	.8
1950	3	1.1	1	.3	4	.7
1951	7	2.5	9	2.7	16	2.6
1952	3	1.1	5	1.5	8	1.3
1953	12	4.4	16	4.8	28	4.6
1954	11	4.0	19	5.6	30	4.9
1955	3	1.1	5	1.5	8	1.3
	63	22.9	74	22.0	137	22.4
Pruned trees[1]						
1940-44	12	4.4	—	—	12	1.9
1940-48	50	18.2	—	—	50	8.2
Total	125	45.5	74	22.0	199	32.5
S_d	—	—	—	—		±1.9
CL .95	—	—	—	—		±3.3

[1]Years in which pines were set out in Plot A.

TABLE 2.—INCIDENCE OF INITIAL FORKING IN A SAMPLE OF 200 RED AND 200 WHITE PINES (9 YEARS OLD)—PLOT B

	Red pine		White pine		Combined	
	Number	*Percent*	*Number*	*Percent*	*Number*	*Percent*
1950	—	—	37	18.5	37	9.3
1951	1	.5	—	—	1	.3
1952	—	—	3	1.5	3	.8
1953	5	2.5	2	1.0	7	1.8
1954	—	—	—	—	—	—
1955	14	7.0	—	—	14	3.5
Total	20	10.0	42	21.0	62	15.5
S_d	—	—	—	—	—	±1.8
CL .95	—	—	—	—	—	±3.5

pine moth (*Rhyacionia frustrana* [Comst.]) attack the leader buds. An examination of Table 1 shows a marked increase in forking in 1951, the year following a very severe ice storm in the Madison area. In some cases, leaders may also be injured in the transplanting program and hence cause forking to show up in the year of transplanting or in the following year. This, too, is evident in examining Table 1. However, Honey (*6*) found that the years 1942-44 showed a relatively high incidence of forking in natural stands of red pine in Oneida County, Wisconsin. This occurred at a time when the Arboretum pines were being transplanted.

5. The age of a stand was thought to be associated with incidence of forking. Büsgen (*2*) states that "as a rule the tendency to lammas shoot formation is greater in youth than in later years." Champagnat (*1*) differentiates between lammas growth and proleptic branches but points out that "proleptic" branches are found more frequently in young trees and more rarely in older trees. Jump (*8*) states, "There seems to be no relation between the age of a tree and its susceptibility to forking, in stands up to 25 years of age."

Our data support Jump's contention. It is conceivable, however, that young plantations with small trees growing in relatively open stands are more susceptible to severe natural disturbances such as snow, sleet, wind, sod competition, animal damage, etc. than are the older, more closed stands. Jump, however, takes exception stating that, "There appears to be no marked correlation between forking and site conditions, except a possible relationship with the mean seasonal temperature of the locality." We feel that none of the investigations here reviewed, including our own, is sufficiently detailed in appraisal to rule out site conditions. The obvious relationship appeared to be between the incidence of forking and some factor or factors of weather.

An attempt was made, through the use of the technique developed by Fisher (*5*), to learn whether correlations exist between the incidence of initial forking in the red and white pines (combined number, Table 1) and year-to-year variations in the patterns of maximum and minimum temperature and of precipitation. Details of the computations involved in this statistical method have been put forth by Houseman (*7*) and Anderson and Houseman (*1*). Weather records of the Madison, Wisconsin, weather station were used. The year was divided into 91 four-day intervals, and computation of the polynomial coefficients and the correlation coefficients were made with the aid of the IBM 650 Magnetic Drum Data-processing Machine of the University of Wisconsin Numerical Analysis Laboratory. The result failed to show any correlations between the three weather factors, tested singly and in combination, with the incidence of forking.

In Jump's paper (*8*) there is also a suggestion that forking seems to reach a maximum after a period of years, then gradually to subside. Further, there are indications that there may be a second cycle in the same planting. Our only record long enough (1940 to 1956) to show two peaks of occurrence is in Arboretum Plot *A*. The early peak of incidence of forking is in the years 1942 and 1943 and a second peak in 1953 and 54. Beer's Arboretum records (1935-1945) for another large pine plantation adjacent to Plot *B*, show an extreme peak in the years 1943-45 where 63 percent of the 11-year total occurs in these three years. Honey (*8*) shows the following table in his report:

Incidence of Prolepsis on Red Pine in Oneida Co., Wis., Dec. 1944

Item	Percentage of trees showing prolepsis in			
Year's growth	1941	1942	1943	1944
Percent	3.1	25.4	13.8	20.0

Here, too, in 1942 and for at least two years following, the incidence of forking is relatively high. Thus it appears that the "peaks" occurred about 10-11 years apart. From these data it could be implied that the factors causing forking are associated with the year rather than with intrinsic factors of the plantation itself (e. g. age, soil, slope, pH, etc.). The results from our younger plantation (Plot *B*) do not support the 1953-54 peak shown for Plot *A*. We cannot account for this. More evidence is necessary to show cyclic occurrences of forking in pine plantations. Our data do not substantiate, but agree with Jump's suggestion that there may be periodic peaks of forking in pines.

TABLE 3.—NUMBER OF RED PINES (16 AND 17 YEARS OLD) EXHIBITING SUBSEQUENT FORKING AFTER ALL BUT ONE SHOOT OF THE INITIAL FORK WERE EXPERIMENTALLY CLIPPED—PLOT A

	1944	1948	Combined
No. clipped and tagged	12	50	62
No. recovered, 1956	8	35	43
Subsequent forking			
1952	—	1	1
1953	1	2	3
1954	—	6	6
1955	—	1	1
Total	1	10	11
Percent of recovery	13	29	26

Results of a Pruning Experiment

Twelve red pines with pronounced forking growing in the U. W. Arboretum plantation were pruned in 1944 to remove the least desirable of the two leaders. The pruned trees were marked with a copper tag. In 1948, these pines were checked and found to be perfectly formed trees with no evidence of having had a double leader. At that time an additional 50 forked trees were pruned and marked. The objective of the pruning was to produce typically-shaped pine trees in a demonstration forest.

Of the 12 trees pruned in 1944, and the 50 pruned in 1948, 8 and 35 respectively were located and examined in 1956 (Table 3).

Since fungi and bacteria are known to enter trees through breaks in the bark, we decided to examine several of the pruned

trees to see whether rot or serious discoloration had occurred at the cutting site.

One red pine from the 1944 and one from the 1948 pruning were felled. Each was over 20 feet in height. The U.S. Forest Products Laboratory at Madison, Wisconsin, sectioned the bottom six feet of each of the two trees, and found no extensive discoloration or rot in either (Figure 1). The pitch plug in the 1944-cut pine was only 0.5 inch long and none developed in the 1948-cut pine although a thin layer of pitch covered the initial cut (see arrow). The important aspect, however, is that clear white sap wood surrounded both prunings.

No experimentally pruned trees showed any external evidence of having been clipped and each tree had a straight bole. In the 13-year interval between pruning and examination, only one of the eight 1944 pines showed subsequent forking. Similarly 10 of the 35 pines pruned in 1948 had produced a second double tip by 1957. These percentages are no greater than those for unpruned trees.

In commercial forest plantations forked trees are usually culled in thinning operations. To prune such trees on a large scale would doubtless be prohibitive. However, in demonstration plantings or in school forests, a program of removing one of the leaders in forked trees may save the appearance of the tree and the value of the plantation.

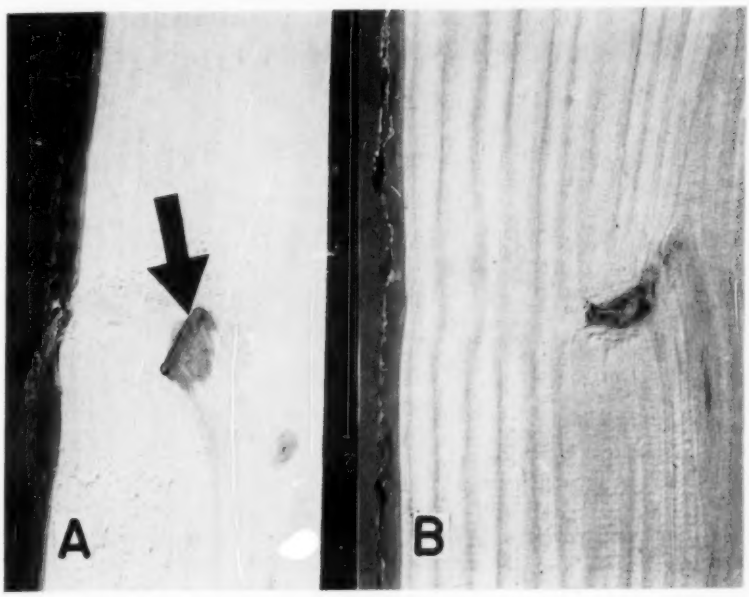


FIG. 1.—Longitudinal sections through the trunks of two red pines from which one of two leaders was pruned. *A*, pruned in 1948; *B*, pruned in 1944.

Acknowledgments

The authors wish to thank R.S. Ellarson who, as a research assistant, helped with the 1948 pruning and marking; and grateful acknowledgment is made to J. T. Curtis for permission to quote unpublished records on the Arboretum pines, to J. A. Larsen who ran the statistical tests on the 650 IBM computor, and to I. C. M. Place, A. J. Riker, and J. T. Curtis for critical reading of the manuscript. B.H. Paul of the U. S. Forest Products Laboratory generously gave advice and assistance in preparing the longitudinal sections of two red pine bolts.

Literature Cited

1. ANDERSON, R. L. and E. E. HOUSEMAN. 1942. Tables of orthogonal values extended to N=104. Iowa Agric. Expt. Sta. Res. Bull. 297. 77pp.
2. BÜSGEN, M. 1929. The structure and life of forest trees. (Third revision and enlarged edition by E. Münch. English translation by Thomas Thomson). John Wiley and Sons, New York. 436 pp.
3. CARVELL, K. L. 1956. Summer shoots cause permanent damage to red pine. Jour. Forestry, 54:271.
4. CHAMPAGNAT, P. 1954. Revue de Cytologie et de Biologie Vegetales, Paris. 15:1-54.
5. FISHER, R. A. 1924. The influence of rainfall on the yield of wheat at Rothamstead. Royal Soc. London, Phil. Trans., Series B, 213:89-142.
6. HONEY, E. E. [1944]. Forest tree diseases observed in Wisconsin during 1944. USDA Agric. Research Admin., Bureau Plant Industry, Soils and Agric. Engineering, Emergency Plant Disease Prevention. 9 pp. Mimeo.
7. HOUSEMAN, E. E. 1942. Methods of computing a regression of yield on weather. Iowa Agric. Expt. Sta. Res. Bull. 302, pp. 863-904.
8. JUMP, J. A. 1938. A study of forking in red pine. Phytopathology 38: 798-811.
9. LITTLEFIELD, E. W. 1956. More on late seasonal growth of red pine. Jour. Forestry, 54:533.

Grazing and Douglas-Fir Establishment in the Oregon White Oak Type[1]

F. C. Hall, D. W. Hedrick, and R. F. Keniston

EFFECTS OF grazing in hardwood areas have been reported by many investigators. With few exceptions these studies have been conducted in eastern forests where the chief concern, as in this study, has been the compatibility of farm forestry and farm flock grazing.

A review of the research on hardwood grazing has brought out the following points: All reports except one (*10*) have recommended exclusion of livestock due to extensive damage to timber reproduction (*2, 3, 4, 5, 7, 14, 15*). However, little or no attempt has been made by the various researchers to determine the amount of forage consumed. No studies have attempted to find the percent of forage that could be taken without damage to the timber stand, i.e., permissible grazing use. Few studies have been initiated with the intent to remove a specific amount of forage. A limited number of papers have discussed season of use as related to timber damage during the growing season. All papers were unanimous in condemning winter use. And finally, the majority of papers have not correlated forage quality with livestock gains.

Stands of Oregon white oak (*Quercus garryana* Dougl.) occupy more than one million acres in western Oregon. These stands are poor producers of forest products because of exceptionally slow growth of the species. Many of these stands have a moderately dense crown canopy and, therefore, support only limited quantities of herbaceous forage for livestock use. Because of the marginal nature of these lands, a problem exists in determining their most profitable use or uses.

Results of ecological studies undertaken near the experimental area (*13*) support the contention that Douglas-fir (*Pseudotsuga menziesii* [Mirb.] Franco) was formerly more abundant on many of these foothills, particularly on the better sites where deeper soils and general northerly exposures favor satisfactory growth of this species. It is believed that burning and cutting practices have been largely responsible for eliminating much of the Douglas-fir.

Since shallower soils on southerly exposures exhibit extremes of temperature and moisture stress inimical to the establishment of young seedlings, it is doubtful if these sites are suitable for farm forestry. However, they do produce sufficient grass growth for spring-fall livestock grazing. It was assumed at the outset of this study that if farm forestry were to be profitable it would have to be practiced on the better sites where soil and growing conditions are suitable for growth of merchantable forest products. Hence the findings of this report are limited to the better forest sites found in the oak-covered woodlands surrounding the Willamette Valley.

Object of Study

Basically, there are three alternatives for increasing the production from these oak woodlands: (1) increase forage production for grazing, (2) convert to profitable timber production, or (3) to combine grazing and timber production. In the latter case, grazing would become an interim use, being limited to a few years following logging (*6, 9, 11*).

In 1952, a study was initiated by the Oregon Agricultural Experiment Station in cooperation with the School of Forestry to help determine the best land uses for Willamette Valley oak stands. This is a long-term project designed to furnish physical data which ultimately can be given an economic interpretation as the areas planted to Douglas-fir begin to yield timber products. Four questions were raised in connection with this program: (1) Can Douglas-fir be established on these oak sites? (2) Is grazing compatible with the establishment of Douglas-fir? (3) What animal production can be expected? (4) Can permanent pasture be established?

Grazing in this study was planned to minimize damage to timber reproduction. In order to accomplish this objective, it was necessary to consider animal as well as plant requirements. The question was asked: If grazing animals are provided with an adequate intake of forages do they avoid using less palatable plants, such as young Douglas-fir trees? Accordingly, grazing management plans were developed which provided for consideration of such important points as: proper forage use, adequate gains on grazing animals, species preference of grazing animals, and control over their season of use. Thus many points overlooked by previous investigators could be evaluated in this study.

Study Area

An area of ten acres was selected near the Oregon State College campus in a stand of oak ranging from 2 to 10 inches d.b.h. (See background of Figure 1.) This experimental tract is located in the western edge of the Willamette Valley. The climate is mild with

THE AUTHORS: Formerly graduate assistant in range management; associate in range management; and associate professor, forest management; respectively, at Oregon State College, Corvallis.

[1]Technical Paper No. 1163, Oregon Agric. Expt. Sta.

a mean annual precipitation of about 40 inches. Precipitation falls principally in the form of rain from about the first of October to June with deficient moisture through July and August and frequently in September. Average minimum temperatures range from about 33°F. in January to 51°F. in August. Temperatures seldom exceed 100°F. in the summer and rarely drop below 0°F. in the winter. The average frost-free period is about 195 days extending from the middle of April to the last of October.

Soils on the study area predominantly belong to the Dixonville series and have a clay loam texture in the surface. A heavy clay layer at 12 inches restricts water penetration, thereby creating a perched water table during the winter months. Underlying parent materials are primarily basaltic with some intermixing of sedimentary deposits.

Oregon white oak is the principal timber overstory with occasional bigleaf maple (*Acer macrophyllum* Pursh.) on restricted sites. Predominant members of the shrub layer are poison oak (*Rhus diversiloba* T. & G.) with occasional snowberry (*Symphoricarpus albus* [L.] Blake) and serviceberry (*Amelanchier florida* Lindl.). A number of species make up the herbaceous layer which is dominated by parsley-leaved lovage (*Ligusticum apiifolium* [Nutt.] Gray.) and sweet cicely (*Osmorhiza nuda* Torr. Nutt.), both members of the carrot family; and two common grasses, woodland brome (*Bromus laevipes* Shear.), and blue wildrye (*Elymus glaucus* Buckl.). Minor components of the plant community include two legumes: vetch (*Vicia americana* Muhl.) and wild pea (*Lathyrus nuttallii* [Torr.] White.). These latter species, though not overly abundant, are valuable forage plants.

Plan and Methods of Study

The ten-acre study area was located south of a strip of 60-year-old Douglas-fir to evaluate natural regeneration. Five randomized two-acre treatments were handled in the following manner:

1. Permanent pasture — clearcut, burned, and seeded to pasture mixture (Fig. 1).
2. Oak underplanted to Douglas-fir.
3. Oak thinned and underplanted to Douglas-fir (Fig. 2).
4. Oak undisturbed—control plot.
5. Oak clearcut — removed all oak and planted to Douglas-fir (Fig. 3).

After fuelwood-size trees were logged from the pasture plot the slash was burned and the following mixture seeded into the ashes at the rate of four pounds each per acre: orchardgrass (*Dactylis glomerata* L.), Tualatin oatgrass (*Arrhenatherum elatius* [L.] Mert.), burnet (*Sanguisorba minor* Cop.), and nangeela subclover (*Trifolium subterraneum* L.).

A good stand of all species except subclover was obtained. In the underplanted oak plot Douglas-fir 2-0 low-elevation stock was used at the rate of 1,000 trees per acre. In the thinned oak nonerop trees were removed which resulted in approximately 70 percent reduction of the original crown cover before planting. On the clearcut plot all salable logs were removed before

FIG. 1.—Pasture plot with undisturbed oak in background. This area was logged, burned, and grass seeded in the ashes. Four to eight yearling sheep utilized 50 to 60 percent of the palatable forage and put on 40 pounds of total gain per acre during the active spring growth period. Note limited oak sprouting.

FIG. 2.—Thinned oak area planted with Douglas-fir. Four sheep gained a total of 23 pounds per acre during the active period of spring growth.

planting to Douglas-fir. No other disturbances except for grazing were made until 1955 when some cutting and spraying of coppice was initiated on the pasture plot. No attempt has been made to control sprouts on other treatments.

Each area, except for the permanent pasture, was divided in half to assess the effect of grazing. Yearling Hampshire and Suffolk ewes were used because cattle were not well adapted to the small experimental areas and to the native forage which is composed mainly of forbs rather than grass. Also, sheep do less trampling damage than cattle on wet clay soils.

Vegetation was sampled on 16 random locations in each treatment. Concentric plots of 1- and 3-milacre size were used for sampling herbaceous and shrub species, respectively.

Planted Douglas-fir on the three-milacre plots were marked with separate stakes to distinguish them from natural regeneration. Records of leader height, average crown diameter, vigor, and amount of browsing were recorded prior to and after grazing and at the end of the growing season. In this way, deer and sheep damage could be separated reasonably well. Natural seedlings were recorded by occurrence in two height classes: less than and greater than six inches.

Sheep were grazed during the spring growing season and an attempt was made to limit herbage removal to about 50 percent of the available palatable forage. The animals were weighed prior to, during, and after grazing and were removed when they failed to maintain weight gains.

Soil characteristics were studied at three inches, in the clay layer at 14 inches, and at 36 inches as follows: Texture according to Bouyoucos (*1*), moisture tension curves by the Soils Department of Oregon State College, and organic matter by the Walkley-Black method (*17*). Seasonal fluctuations of soil moisture at 3 inches, 12 inches (top of the clay layer), and 36 inches were recorded by the use of Coleman fiberglass moisture units. These units were calibrated by taking gravimetric field samples simultaneously with electrical resistance readings.

Results

Data from the four seasons of grazing covered by this paper have provided tentative answers to the short-term objectives of the study as well as obtaining some information on grazing management problems.

Effects of grazing on Douglas-fir. —The effects of grazing on Douglas-fir varied according to the management of the animals. Under proper management the sheep did not damage the seedlings by either browsing or trampling (Table 1, 1956 season) except in areas of concentration which were not sampled. Animals were left in all areas except the pasture plot during the first season, 1954, until they lost weight in order to evaluate some conditions pertaining to browsing (Tables 1 and 2).

During the two following seasons an attempt was made to graze in such a manner as to avoid damaging the Douglas-fir. However, there was some reduction in height growth of planted Douglas-fir on the clearcut plot in 1955 when the sheep were turned into the area before herbaceous forage was sufficiently developed (Table 2). The cause of fir browsing in this case was a lack of forage. Excessive utilization too late in the season in the underplanted unit was the cause of the minor damage in this area (Table 1).

Sheep browsing as reported in Table 1 was obtained by checking Douglas-fir for damage before the sheep were turned into the plot and after they left. Any damage during this period was attributed to sheep even though part of it may have been caused by wildlife. Any damage prior to sheep grazing was considered to be caused by wildlife (both deer and rodents) as well as all damage that occurred on the plots ungrazed by sheep. No attempt was made to summarize the intensity of browsing since reduction in tree height was considered to be more quantitative than the subjective terms of heavy, moderate, or light. However, since deer browsed in all areas not used by sheep, one would not expect significant differences in height (Table 2) except where sheep browsing was excessive. An overall evaluation could probably best be summarized by saying that all trees were subject to moderate browsing by deer. During the four seasons in which browsing was followed nearly all trees browsed by sheep had been previously damaged by deer.

FIG. 3.—Clearcut oak planted with Douglas-fir. Note the vigorous sprouting. Two to four sheep gained a total of 40 pounds per acre during limited spring growing season.

No appreciable cropping of Douglas-fir by sheep was found the third and fourth seasons. Animals were not turned in until the leaves of the palatable forage plants were two-thirds developed. At this stage forage was being produced faster than the animals could eat it—a time referred to by graziers as range readiness. Animals must be removed when utilization of these key species reaches a maximum determined by their physiological requirements for accumulation of carbohydrate reserves, maintenance of vigor, and adequate seed production. This corresponds, in general, to removal of about 50 percent of the current year's production of the key species. Under these conditions sheep will maintain good weight gains and no appreciable damage to Douglas-fir will occur.

Key forage species and their tolerances to grazing vary with the associated cover. In this study the carrot-like herbs and grasses in the *leafy* stage were key species in the clearcut area, receiving about 40 to 50 percent use. Vetch and wild pea received 50 to 60 percent use. On the average, only about one-half of the current year's growth of the key species was utilized in each treatment area. In this study, proper use amounted to about 25 percent of the total herbaceous production, since the sheep did not browse the shrubs appreciably in the spring growing period.

A significant point has been brought out on the clearcut area by the browsing damage in the second season (1955) and by the lack of damage in the third (1956). In both cases the sheep gained the same weight per acre—41 pounds. The difference was *management*. In one case the gains were made at the expense of the good forage plants. Better management, which involved a reduction in sheep days of grazing, improved the vigor of the palatable species and minimized damage to the Douglas-fir while maintaining the same gain per acre.

TABLE 1.—SHEEP AND WILDLIFE DAMAGE TO PLANTED DOUGLAS-FIR. FIGURES SHOW PERCENT OF YOUNG TREES BROWSED ON SIXTEEN 3-MILACRE PLOTS IN EACH TREATMENT

Oak treatment	Sheep browsing				Wildlife browsing			
	1954	1955	1956	1957	1954	1955	1956	1957
	Percent				*Percent*			
Underplanted	14	9	0	0	32	45	40	25
Thinned	12	0	0	6	27	80	22	10
Clearcut	29	82	0	6	11	28	21	12
Means	18	30	0	4	23	51	28	13

Deer browsing.—Browsing by deer has been pronounced, but an accurate evaluation of this effect cannot be made readily because a deerproof exclosure was not established. As indicated in Table 1, all areas grazed by sheep also suffered wildlife damage generally greater than that inflicted by sheep. Low woven wire fencing used in this study had no measurable effect on deer movements. Most of the wildlife damage occurred prior to range readiness in the spring and resulted from a combination of lack of preferred forage and availability of the transplants to browsing, i.e., extending above other protective vegetation. Douglas-fir appears to be palatable to deer in the bud-bursting stage when the new growth is quite succulent.

Animal gains.—Animal gain was influenced by several factors. Treatment of the oak was of primary importance and indicated that the more open the oak the more gain per acre. As might be expected, this is directly proportional to the increase in forage production (Table 3). These findings are similar to results obtained from work in Missouri (*10*) and Texas (*8*).

The effect of variation in protein content, particularly between grasses and legumes, was evident in this study and was reflected in the efficiency of gain produced by the pasture area compared to the clearcut. Both areas produced the same amount of gain for two years, 40 pounds per acre, but varied considerably in the number of days required to attain this gain.

This difference was most marked during the 1956 season when sheep on the clearcut plot gained 1.46 pounds per animal day as compared with only 0.37 pounds per animal day on the pasture area. A large proportion of the cover on the clearcut plot was composed of forbs and legumes as compared

TABLE 2.—AVERAGE HEIGHT AND CROWN SPREAD OF PLANTED DOUGLAS-FIR BY OAK AND GRAZING TREATMENTS. THE CLEARCUT AREA WAS PLANTED IN 1952, THE OTHER TWO IN 1953. MEASUREMENTS WERE BEGUN IN 1954. EACH MEAN IS BASED ON MEASUREMENTS OF 15 TO 20 TREES

Oak treatment and sheep grazing	Number of years since planting									
	1 Year		2 Years		3 Years		4 Years		5 Years	
	Height	Spread	Height	Spread	Height	Spread	Height	Spread	Height	Spread
	Inches									
Underplanted in 1953										
Grazed	8.2	4.5	12.0	6.6	13.9	7.5	18.1	12.4	----	----
Ungrazed	6.6	3.5	10.0	5.0	13.2	6.6	16.5	10.0	----	----
Thinned 1952 and planted in 1953										
Grazed	7.7	4.1	12.9	7.2	18.5	10.2	25.6	15.3	----	----
Ungrazed	10.0	5.3	13.0	6.2	17.6	8.6	23.1	13.4	----	----
Clearcut and planted in 1952										
Grazed	----	----	11.6*	6.2	16.2*	10.0	22.6	11.3	32.1	15.7
Ungrazed	----	----	15.3	6.9	21.5	10.7	27.2	14.8	35.6	20.0

*Represents significant reduction at the 5 percent level in height brought about by excessive browsing the first two years the plots were grazed.

TABLE 3.—NUMBER OF DAYS OF SHEEP GRAZING AND TOTAL GAINS PER ACRE OBTAINED ON YEARLING HAMPSHIRE AND SUFFOLK EWES FROM 1955 THROUGH 1957

Treatment	1955 No.		1956 No.		1957 No.		Means No.	
	Sheep days	Gains lbs.	Sheep days	Gains lbs.	Sheep days	Gains lbs.	Sheep days	Gains lbs.
Undisturbed (check)	28	1	28	21	32	—3	29	5.7
Underplanted	28	1	14	14	32	+4	25	6.3
Thinned	66	24	28	23	32	+3	42	16.7
Clearcut	84	41	28	41	32	—3	48	26.0
Pasture	92	40	84	39	38	15	71	31.3

with a preponderance of grass on the pasture area. Had cattle been used, the opposite results would probably have been obtained. Differences in 1955, while not as pronounced, due to poor management on the clearcut, still favored the clearcut area. However, the 1957 grazing data indicate that the clearcut area had finally become inferior to the pasture area after four years of grazing. Undoubtedly the rapid increase in growth of oak sprouts brought about a significant reduction in the amount of available forage.

Grazing season.—Length of the grazing season was influenced by treatment of the oak. Improved grasses in the pasture area attained range readiness about two weeks before the native vegetation and could be grazed for four to six weeks. The undisturbed oak supported animals for about one week while the clearcut area could be grazed for a two-to three-week period. Thinning the oak lengthened the season from one week to about ten to twelve days.

Establishment of Douglas-fir.—Douglas-fir establishment was not adversely affected by treatment of the oak. Survival of planted stock ranged from 67 to 90 percent. Much of the early mortality occurred as a result of the dry fall in 1952. To date, the effect of shade or moisture competition has not been detrimental to the establishment of transplants but growth of seedlings has been notably less in the underplanted plot than in the clearcut and thinned areas. However, several more years must elapse before the competitive relationships between these two species can be fully evaluated. Numerous observations and limited studies that have been made throughout the range of Oregon white oak in the Willamette Valley clearly indicate its seral relation to Douglas-fir (*12, 13*).

Natural seedlings have been established within 300 feet of the seed source at the rate of about 1,000 per acre over a 6-year period. The rate is lower in the pasture area. Hand planted seed indicated that rodents and not soil moisture have been the principal limiting factor in natural Douglas-fir seedling establishment in the pasture. Neither deficient soil moisture nor grass competition has significantly limited seedling establishment in these trials. One must remember that these results were obtained on a relatively favorable site, not on extremely poor sites for Douglas-fir.

Soil moisture.—In 1956 soil moisture was influenced both by oak treatment and grazing. During the growing season surface soil of the pasture area dried more quickly and uniformly than soils in the other treatments (Fig. 4). Clearcut, thinned and underplanted areas dried more slowly, in the order named. In 1957 these treatments showed the same relationship except that in the early fall they were wetted in reverse order with the pasture the most moist. It appears reasonable that sporadic showers were intercepted in proportion to the amount of oak canopy remaining.

Grazing markedly influenced soil moisture in the clearcut area at the 3- and 12-inch depths (Fig. 5). No influence was detected at 36 inches. The grazed portion was somewhat wetter at the 3-inch depth and much more moist than the ungrazed at 12 inches. This lower moisture loss probably resulted from reduced transpirational loss after the foliage was grazed. A majority of the plants on this area are forbs that do not replace grazed foliage as

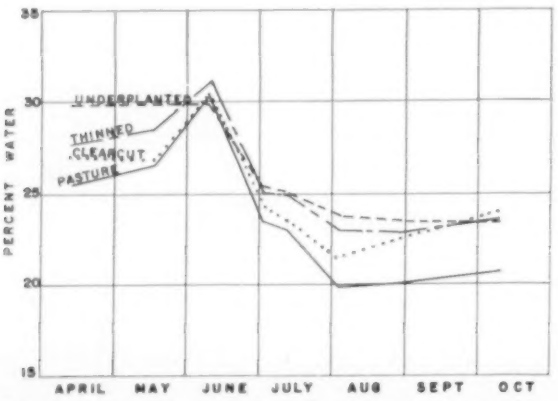


FIG. 4.—Soil moisture trends and oak treatment at 3-inch depths during 1956 growing season. Approximate wilting point is 20 percent.

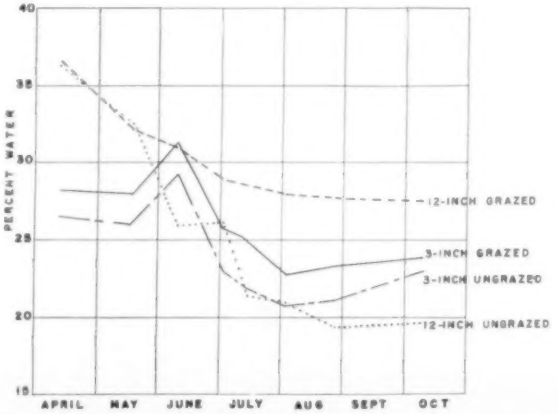


FIG. 5.—Influence of grazing on soil moisture trends on the clearcut area at 3- and 12-inch depths in the 1956 growing season. Wilting range is between 20 and 25 percent.

rapidly as grasses. Consequently, when 20 to 30 percent of the vegetation is removed, as was the case here, a direct reduction in transpirational loss throughout the entire season results.

Establishment of pasture.—Establishment of permanent pasture on similar oak sites was investigated prior to this study by Valassis (*16*). The techniques evaluated in this work were used in the establishment of the pasture area for this study and they have proved to be successful. Since, however, the problem of controlling oak sprouts still exists, additional research is being conducted to study better methods of oak removal to minimize sprouting.

Grazing as a tool in Douglas-fir management.—Although it is generally believed that regenerating Douglas-fir stands should not be grazed, under certain conditions livestock may become an important tool for use by the silviculturist. If reduction in palatable vegetation decreases the competition of these species with Douglas-fir for moisture and nutrients, it is entirely possible that grazing might provide one way of improving establishment and growth of young Douglas-fir trees. In plantations, tree seedlings would be even-aged and perhaps grazing could be more easily managed to avoid browsing damage by sheep. Cattle have been grazed on some commercial tree farms to reduce fire hazard and remove palatable grasses. It is entirely possible that, under careful management, sheep would be more effective for this purpose.

Summary

In this study of farm forestry and grazing in the more productive oak woodlands of the Willamette Valley of Oregon, four questions were raised. These have been tentatively answered as follows:

1. Douglas-fir can be established under these stands with a considerable degree of success.

2. Sheep grazing, when carefully and properly managed, appears to be compatible with the establishment of Douglas-fir and under certain conditions favorably affects soil moisture.

3. The animal production per acre is influenced by the amount of crown cover of the oak, by the composition of forage species and by livestock management. Gains per acre by yearling sheep are sufficient to tentatively justify grazing these areas in the early stages of Douglas-fir forest regeneration if other suitable pastures are available to carry the principal grazing load.

4. Permanent pasture can be established with a minimum of seedbed preparation on sites similar to those described in this study, but unless maintained by adequate provision for sprout control, it will revert to a forested area within a period of ten years.

In addition, the study has pointed out that the absolute necessity of *proper timing* (season of use) and *correct utilization* of palatable plants (proper stocking) in avoiding damage to the establishment and growth of commercial Douglas-fir.

Literature Cited

1. BOUYOUCOS, G. F. 1928. The hydrometer method for studying soils. Soil Science 25:365-369.
2. CHAPLINE, W. R. 1933. Forest ranger and a forest range problem. From "A National Plan for American Forestry." U. S. Congress. Senate Document No. 12. (Separate No. 27:527-562.)
3. DEN UYL, D. 1945. Farm woodlots should not be grazed. Jour. Forestry 43:729-732.
4. DILLER, O. D. 1935. The effect of woodlot grazing on certain site factors in the oak-hickory type. Columbus, Ohio. U. S. Dept. Agric. Central States Forest Expt. Sta. 4 pp. Note No. 24.
5. ———. 1937. The forage cover in heavily grazed farm woods of northern Indiana. Jour. American Soc. Agronomy 29(11):924.
6. INGRAM, D. C. 1928. Grazing as a fire control method in Douglas-fir cutover land. Jour. Forestry 26:998-1005.
7. KAUFMAN, R. D. 1948. Forest grazing in the North Carolina piedmont. Proceedings Soc. Amer. Foresters 48:239-244.
8. KOSHI, PAUL T., *et al.* 1954. Forage production in oak woodland as influenced by removal of tree cover. Texas Agric. Expt. Sta. Progress Report No. 1661:1-4.
9. LINDGREN, H. A. 1935. Report on the feasibility of grazing livestock on the cutover timber lands of Columbia and Clatsop counties, Oregon. Corvallis, Oregon State College, School of Agric. 10 pp.
10. MARTIN, S. C. 1954. Grazing-forestry relationships in the Missouri Ozarks. Proceedings Soc. Amer. Foresters 54:203-205.
11. REID, E. H. *et al.* 1938. Plant succession in a cutover, burned, and grazed Douglas-fir area. Portland, Oregon. U. S. Dept. Agric. Pacific Northwest Forest and Range Expt. Sta., 8 pp. Research Note No. 26.
12. SPILSBURY, R. H. and D. S. SMITH. 1947. Forest site types of the Pacific Northwest. B. C. Department of Lands and Forests Tech Publ. T30.
13. SPRAGUE, F. LEROY and H. P. HANSEN. 1946. Forest succession in the McDonald Forest, Willamette Valley, Oregon. NW Science 20:89-97.
14. STEINBRENNER, E. C. 1951. Effect of grazing on floristic composition and soil properties of farm woodlands in southern Wisconsin. Jour. Forestry 49:906-909.
15. TRENK, F. B. 1954. Effect of grazing on timber in the Lake States. Proceedings Soc. Amer. Foresters 54:201-202.
16. VALASSIS, V. T. 1955. Some factors affecting the establishment and growth of improved forage species on Laughlin-like soils in western Oregon. Ph.D. thesis. Corvallis, Oregon State College.
17. WALKLEY, A., and I. A. BLACK. 1939. An examination of the Degtjareff method for determining soil organic matter, and a proposed modification of the chromic acid titration method. Soil Science 27:29-38.

Two New Formulae for Predicting Growth Percent

Harold Cahill Belyea

THE CONCEPT that the yearly accretion of wood material in a tree or a stand is a compound interest phenomenon is one of the more natural and at the same time more widely accepted conclusions regarding the growth of trees and forests. As foresters, we are interested in the establishment of growing, maintaining and harvesting a naturally replaceable resource. Further interest seeks the measurement of these phenomena in size, volume, amount and rate. The treatment of these increments as interest compounded on the appropriate dimensions of the current tree, or stand, is one of the simplest and at the same time one of the most consistent techniques to be used in considering tree growth.

Like other techniques for measuring growth, the method is not without its faults and limitations as have been previously pointed out both by Rudolph and by Wahlenberg. However, granting that these limitations are clearly recognized and due allowance made, this method can be made quite as acceptable as any of the other several procedures used in predicting future growth. Stating the actual accretion of each year as a percentage rate has the effect of placing the growth, particularly if it is in terms of stand volume, on the basis of a rating of the actual productivity of the area unit on which the stand is found. It offers a basis of comparison with the growth of other units, other species and other methods of managerial treatment.

The purpose of the present article is to suggest two new formulae for growth percent, both of which are based on the compound interest principle and both of which offer some superiority of ease in computation and application to actual trees and stands. Both of these formulae can be used with any measurable magnitude in tree and stands and both are easily adaptable to any of these measurable dimensions whether it be of diameter, height, form class, basal area or volume. It is also believed that both of these offer close approximation to the growth percent pattern where and when a desirable degree of precision is demanded.

Strictly speaking, a mathematical formula only describes the phenomenon. It does not explain it, and precise scientific investigators are most emphatic on this point. Consequently, before we can have a mathematical expression, we must know what the phenomenon is and be able to describe it in words or pictures or in terms of raw data, or in some other correlated form. The task of the mathematician, in reference to this material, is not to further explain it, but to describe it in terms of his own language, namely, symbols.

The problem which we have under our consideration is a rather narrow facet of the whole function of growth of a tree. Given the "size," or dimensions, or mass, i.e., volume of a tree at two given times separated by a time interval of known length, the problem then becomes that of computing the *average rate of changes* in size or mass over that given interval of time. There are two ways in which a given object can increase in size which can easily be expressed by mathematical formulae in such a form as to be easily understood and readily acceptable. One is that of arithmetical progression and the other is that of geometric progression. One very simple and widely accepted expression of the growth of a tree over a given interval of time which embodies the postulate of arithmetic progression is the well known Pressler formula. For the purpose of this demonstration we can designate S as the larger of two dimensions or magnitudes separated from the smaller one s by a known interval of n years. Then according to Pressler:

$$P : 100 : : \frac{S'-s}{n} : \frac{S'+s}{2} \quad (1)$$

or more concisely:

$$P = \frac{S'-s}{S'+s} \cdot \frac{200}{n} \quad (2)$$

Geometric Growth Percent

It is to be noted in the foregoing Pressler formula that we are not given a series of size values covering the annual progression of growth through the given period, but only two, one at the beginning and the other at the end of the time interval denoted by n. It would seem that ordinarily and with but minor reservations we can accept the numerator, $\frac{S'-s}{n}$, as an expression of the average yearly increase in size over the period of n years. It will not be absolute in comparison with the growth of any one year, but it will be a fair average annual approximation for the entire period of n years.

The denominator of $\frac{S'+s}{2}$ is not so satisfactory a term in our formula, because it does not represent a valid average for the purpose we have in hand. It thus becomes necessary to define what is a valid average in the light of this purpose. As before stated, we are not given a series of data representing the successive annual attainments

THE AUTHOR is professor of forestry, University of Vermont, Burlington.

of size over the period represented by n years but only two, the one at the beginning represented by small s and the one at the end of the period represented by large S. But let us suppose we had been given all the figures of year growth in between represented by s, s_1, s_2, s_3, s_4, etc., up to S. Then a valid average as applied to this data would be one that gives the same numerical result when applied to the entire series as it does when applied only to the extremes of the series.

Thus, if the series is truly a geometric progression, the same numerical result should be obtained by taking the square root of the product of the extremes as would be gotten by taking the *geometric average* of every figure in the entire series. If, as, and when the same value is *not* being obtained, by these two calculations, then the valid or appropriate average is not being used. Fundamentally, that is why the Pressler formula with its arithmetic average is not acceptable. It is an average based on the *arithmetic mean* of the extremes and it will not be the same as the geometric average of the entire series or even the geometric average of those two same extremes and as such is not desirable, at least as long as our supposition holds true that the process of growth in a tree is a geometric progression.

It thus seems obvious that if we seek greater validity in our growth percent formula, it should be done through a change in the value and the calculation of the denominator. We are given but two values, s and S', representing size at the beginning and at the end of the period. The most obvious calculation which will use these two values and at the same time meet with the conception of a geometric progression is that of obtaining the *geometric mean* of these two values by extracting the square root of their product. Since this calculation based on the extremes gives no consideration to the intervening values, it might be urged that it will at best be another approximation, but it will be a much closer approximation than that where the base on which the annual growth is computed is an arithmetic mean, and it may be a very good approximation.

Thus, our Geometric Growth Percent would be computed as follows:

$$p : 100 : : \frac{S'-s}{n} : \sqrt{S' \cdot s} \quad (3)$$

$$\text{and } p = \frac{S'-s}{\sqrt{S' \cdot s}} \cdot \frac{100}{n} \quad (4)$$

The strength of this formula lies in the fact that it meets the main requirements of geometric progression in that the mathematical base of the rate change is a geometric average. All scientific, statistical and biological evidence that we now have indicates that any increment change in a tree will follow the geometric rather than the arithmetic form of progression. To adequately describe that change by formula, such formula should conform to geometric computation. It may be a modified form of the geometric, but at any rate it can never follow the arithmetic form, and it would seem that any arithmetic form such as the Pressler formula for growth percent must be in error. It would follow logically that if there be any others which depend on arithmetic progression, they too, must be in error.

Organic Growth Percent

It has already been stated that fundamental growth process in a tree seems to follow a geometric pattern. That is, a tree is a living organism and like all other living organisms, according to all information available, "grows" by a process of subdivision and multiple increase in the number of its living cells. This process of mitosis, this growth or increase by subdivision and multiplication, can only be exactly represented as a geometric progression. As we have no practical way of determining either the actual number of the cells involved or of the number of subdivisions which have taken place within the given time interval, we can only measure the effect, that is, the difference in size from the beginning to the end of the given time interval.

If the entire growing process from seedling to old age were both a continuous and a continuing process under definitely constant and/or controlled conditions, it would be found that the pattern of the growth of the tree would follow this mathematical expression exactly. But because of the activating and inactivating rhythms of the growing season, because of variations in conditions for growth from year to year, because of changing abilities for growth correlated with age and inherent in the tree itself, and because of the constant change in the mathematical base on which the growth is laid, there is no formula known to man which will express the average rate of growth for the entire life of the tree as a mathematical value and at the same time *mean anything*. This is because absolute increments of growth, as well as their rate, always vary with every increment of time.

For relatively short intervals of time, however, five, ten, fifteen, or even twenty years, all of which in the life of a tree are relatively short intervals, the mathematical expression of growth, as suggested above, may hold. If the full life cycle of the tree were used, the results, if plotted on standard coordinate paper, would approximate the form of an elongated letter S. This is a phenomenon which is common to all forms of organic growth, as has been pointed out by Raymond Pearl and other statistical investigators, whether it be a culture of germs in a test tube, or the weight of a guinea pig in a biological experiment, or the trends of population in the United States of America.

Accepting then this assumption that trees grow by a process whereby a very large but unknown number of microscopically minute cells subdivide and re-subdivide very rapidly through a more or less known or given interval of time we can proceed. When the number of cells involved is large and the speed

of multiplication is very rapid so that, for a short time at least, it approaches continuous growth, the process then becomes one of a compounding of infinitesimals and it *can* be described mathematically. To do this, let us start with the familiar Compound Interest formula, to wit:

$$p = \left(n\sqrt{\frac{S'}{s}} - 1 \right) \cdot 100 \qquad (5)$$

which can be more simply rewritten to read:

$$1.0\, p'' = \frac{S'}{s} \qquad (6)$$

or again:

$$S = s\,(1+.op)^n = S\,(1+r)^n \qquad (7)$$

When n = the length of the time interval in years
s = the size dimension at the end of the interval
.op = the rate of change expressed as a decimal
r = the rate of change expressed as a percent.

The above formula holds good only when the compounding takes place but *once* a year, and *at the end of that year*. However, it does not fit in with our basic assumption that the organic growth of a tree as a vegetation organism is over a given interval of time a matter of the splitting and resplitting of a myriad of individual cells at so fast a rate that the "compounding" seems to be taking place continuously. Consequently, whether the units of time be considered either as relatively short or of longer duration, we must perforce introduce into our formula some value to represent the number of times the compounding takes place for every unit of n. Let this value be represented by the letter "t" and our formula becomes:

$$S' = s\,(1 + \frac{r}{t})^{n't} \qquad (8)$$

This formula then describes the growth not as a series of steps, though infinitely small, but as a smooth continuous curve. In its present form it is not subject to easy manipulation or calculation, especially when "t" is very large.

Suppose we let $K = \frac{t}{r}$

then $t = Kr$

and then substituting in formula 7 we get

$$S' = s\,(1+\frac{1}{K})^{Krn} \qquad (9)$$

or more simply

$$S' = s\left[(1+\frac{1}{K})^{K}\right]^{rn} \qquad (10)$$

Now let the number of compoundings per year be increased to a very large number. Then as t approaches infinity, K does also, but as K approaches infinity then $(1+\frac{1}{K})^{K}$ approaches e (whose value is approximately 2.7182818), the base of the natural or Naperian logarithm system. When these compoundings are so frequent and so rapid as to approach a continuous change, then formula (10) may be re-written as:

$$S' = s \times (\text{"}e\text{"})^{rn} \qquad (11)$$

Or in terms of natural logs:

$$\text{Log}_e S' = \text{Log}_e s + rn \qquad (12)$$

or solving for r:

$$r = \frac{\text{Log}_e S' - \text{Log}_e s}{n} \qquad (13)$$

Natural logarithms are for mathematicians rather than foresters. To be able to use tables of common logarithms, formula (13) is written as its equivalent:

$$p = \log_e 10\,(\log_{10} S' - \log_{10} s) \cdot \frac{100}{n} \qquad (14)$$

For ordinary computations, this becomes:

$$p = 2.3^{1}\,(\log S' - \log s) \cdot \frac{100}{n} \qquad (15)$$

the Organic Growth Percent Formula.

[1] $\text{Log}_e\ 10 = 2.302585\ldots$ where greater precision is needed.

Summary

Two new formulas are offered for the computation of the rate of growth over a given period in the form which we call growth percent. It is believed that both of these conform more closely to the geometric progression of the actual processes of tree growth than do other techniques and formulas now in current use. The second of these, the Organic Formula, is definitely postulated on this premise and is believed to be as good a statement of this process as is the generally accepted standard of the Compound Interest Formula.

The Geometric Formula has both advantages and limitations. Its major advantage lies in the fact that in its very computation it admits of the geometric progression which it endeavors to describe. Its limitation, apart from the common unfamiliarity of its use, is that such description is based upon but two steps, or rather the demonstration of but two steps in that progression, namely, the first and the last, and that all intermediate steps in the process must by necessity be disregarded. But even so, it forms a very shrewd and close approximation and will be found yielding results which cling closer to the values of the Compound Interest Growth Percent formula than does any of the other two formulas. A demonstration of this is offered in the tabulated results of the computation of growth percent by four different formulae. All results are carried out to thousandths of a percentage point. These values could be in terms of volume, basal area or even diameter in inches either outside or inside the bark, or any other measurable dimension of increment or increase. For purpose of this demonstration the older and much used Compound Interest formula has been set up as the standard of comparison. Furthermore, the growth percent computations for all four formulae have been determined on the basis of the total volumes of average trees of the several size classes.

From the foregoing, several conclusions may be drawn.

TABLE 1.—ADIRONDACK SPRUCE, GROWTH PERCENT BY FOUR DIFFERENT FORMULAE

		Pressler			Geometric			Organic		
	Compound interest growth percent	Volume growth	Divergence from compd. int. values		Volume growth	Divergence from compd. int. values		Volume growth	Divergence from compd. int. values	
D.b.h.	Vol. gro. %	percent	Units	%	percent	Units	%	percent	Units	%
6	11.750	10.164	−1.586	−13.50	11.140	−0.010	−0.80	11.150	−0.597	−5.08
8	10.850	9.695	−1.155	−10.64	11.089	+0.239	+2.20	10.584	−0.266	−2.45
10	13.641	13.641	−2.350	−17.23	13.679	+0.038	+0.28	12.790	−0.851	−6.23
12	11.325	9.830	−1.495	−13.20	11.288	−0.037	−0.33	10.762	−0.563	−4.97
14	7.253	6.731	−0.522	− 7.20	7.154	−0.099	−1.36	7.004	−0.249	−3.43
16	5.050	4.829	−0.221	− 4.38	4.976	−0.074	−1.46	4.927	−0.123	−2.43
18	3.856	3.731	−0.119	− 3.09	3.789	−0.061	−1.58	3.775	−0.075	−1.94
20	2.717	2.662	−0.055	− 2.02	2.715	−0.002	−0.01	2.677	−0.040	−1.47
22	2.217	2.101	−0.116	− 5.23	2.213	−0.004	−0.01	2.109	−0.108	−4.87
24	1.450	1.439	−0.011	− 0.76	1.443	−0.007	−0.02	1.433	−0.006	−0.02
26	0.873	0.860	−0.005	− 0.57	0.869	−0.004	−0.003	0.869	−0.004	−0.01
Ave.	6.452	5.758	−0.694	−10.76	6.450	−0.002	−0.030	6.187	−0.265	−4.11

1. The use of the Compound Interest formula as the standard seems to be justified not only because of its longer and wider acceptance and use, but also because it adequately describes the process it demonstrates and does so on a basis of desirable mathematical precision and accuracy.

2. The Pressler formula shows the widest divergence from the standard of the other three. In fact, it will show the widest divergence from any one of the other three.

3. It will be noted that with similar data, the Pressler formula underruns the average values of the standard by 10-¾ percent with an extreme of 17¼ percent in the lower diameter classes. It also shows an overall divergence from its nearest competitor, the Organic formula, by almost 7 percent.

4. This is perhaps to be expected since in its computation the Pressler formula is based on the concept of arithmetic progression, it does not seem to fully conform with the natural processes of tree growth. Its results are always in terms of simple interest.

5. As has also been pointed out by previous writers in this field, it will also be noted that as they progress through the larger diameters, all methods not only show percentages of decreasing value, but also that such values approach very closely to those of the standard. This last seems due to the fact that over short periods of time, low rates of simple and similar low rates of compound interest give approximately equal values.

6. Similarity of such values in the upper diameters will be rather quickly eliminated in any growth computation where a range of tree sizes is met as in the all aged forest by a proper counterbalancing against the preponderance of numbers or weights in the smaller sized diameter classes.

7. Taking all these things in consideration, it is suggested that on the evidence herein advanced, the Pressler formula is the least desirable of the four in growth computation and prediction.

8. The Geometric seems to be the more difficult in computation. Furthermore, the technique is not generally familiar in ordinary practice. However, the extraction of the root square which is a very early technique in statistical computation and is in reality, but another expression of the geometric mean. Any forester with but minor training in modern college mathematics should have no trouble in its comprehension and use.

9. Applied to our data, the Geometric growth percent values not only show the smallest overall deviation from the standard, but also show the least variation and the smallest range of divergence of any of the three. The overall divergence through the several diameter classes is less than ⅓ of 1 percent.

10. The Organic values definitely show lower deviations from the standard than does the Pressler. They also show an overall deviation of less than 5 percent. It would be found that if overall growth percent calculations were acceptable within values of one decimal point the Organic method would be a quick, easy, and acceptable method of computation.

11. If it is to be accepted that the growth processes in tree follow a geometric progression and once the unfamiliarity of computation of the geometric mean is overcome, it might seem that the Geometric Growth Percent method might prove a more desirable formula for general use. The above demonstrations, it is believed, suggest that at least it is worth further trial.

Bibliography

1. BELYEA, H. C. 1922. Current annual increment of red spruce and balsam fir in the western Adirondacks. Jour. Forestry 20: 603.
2. RECKNAGEL, A. B. 1922. Growth of spruce and balsam in the Adirondacks. Jour. Forestry 20: 598.
3. RUDOLPH, P. O. 1930. A comparison of several of the growth percent methods of predicting growth. Jour. Forestry 28:28.
4. WAHLENBERG, W. G. 1941. Methods of forecasting timber growth in irregular stands. Tech Bul. No. 796. U. S. Dept. Agric.

Obtaining Vertical Aerial Photographic Coverage with a 35 mm Camera

J. W. Willingham

VERTICAL aerial photographs have been of incalculable value in the management of forest lands but in many instances the forester has been prevented from realizing the full benefits that photographs make available. Incorrect scale, improper tonal quality, age, nonavailability, and excessive cost for obtaining coverage of small areas are but a few of the reasons why the forest manager is in many cases denied all of these benefits. A technique utilizing a 35 mm Camera and a light plane can remove many of these hindrances, especially when a small acreage is involved. This technique can be useful in other branches of land management as well.

It is not suggested that the coverage obtained in this way should replace high quality coverage obtained by aerial photographic contractors. In fact, this method should only be applied when conventional vertical coverage is not obtainable or is limited in use by one of the factors previously mentioned. The 35 mm method has a high pictorial value but should be used with caution for other than visual interpretation since a large number of factors are not controlled in the photographic process. Tip and tilt are held near a minimum but only by visual means and the film is held flat in the photographic step only by a pressure plate and by a glass plate in the enlarging step. Either of these latter two reasons could possibly introduce gross linear errors in the enlarging process.

Throughout the past year a number of flights have been made for the purpose of developing this 35 mm technique. The method evolved from these flights makes possible high quality coverage of relatively small areas at moderate cost. The detail exhibited in these photographs is excellent, tonal quality is comparable to conventional coverage and no image motion has been detected (by visual inspection) to date.

The average amount of tilt present has not yet been determined but it appears to be near a minimum as judged on the basis of scale variation from one side of the individual photographs to the other. Very little difference in scale between photographs has been evident. The stereovision qualities are acceptable and can be used even though the stereoscopic use of this coverage is not its greatest asset. The contact size stereo-pair shown in Figure 1 exhibits many of the qualities just mentioned.

The coverage produced by this method may well be used as individual prints but can perhaps best be used when assembled as a mosaic. The limited coverage of a single print or a stereopair prevents wide usage in that way. The individual prints are useful when an extremely large scale is desired of a limited area.

The scale can be easily varied in the enlarging process but of course the area covered by a single exposure cannot be increased. At the recommended altitude of 4,000 feet a single exposure covers approximately 126 acres.

Procedure Followed and Recommendations

Camera.—A Canon II D camera was used on all flights. This is a Leica-type, made in Japan. It has a high quality 1:1.8, six element, 50 mm focal length lens with a focal plane shutter. There are many other cameras available that should give equally satisfactory results.

Film.—Two types of film were used. Eastman Kodak Plus X was first tried with results that were satisfactory but not equal to the quality produced when Eastman Kodak Panatomic X was used. Panatomic X is a slow, fine grain, thin base film. The success of the flights made and the practicability of this system can be attributed, in a large measure, to the availability of this recently introduced film. This type of film is also produced by other manufacturers and should give equally satisfactorily results.

THE AUTHOR is assistant professor, School of Forestry, University of Florida, Gainesville. This article is based on a thesis prepared for a Master of Science degree by Harold J. Hill, graduate student, School of Forestry, University of Florida.

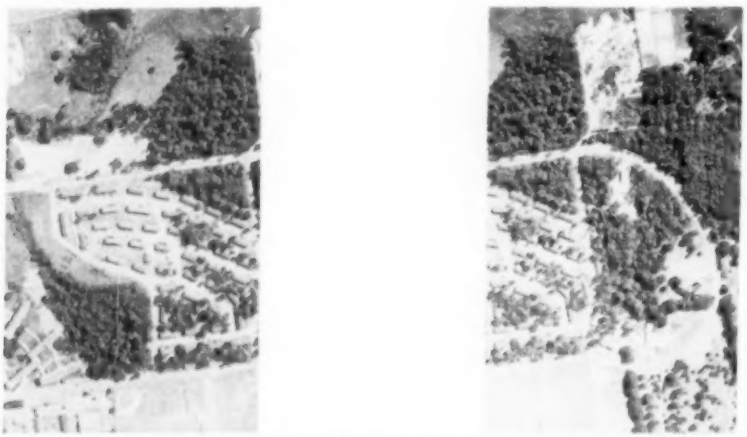


FIG. 1.—Contact stereo pair of a forested area made with a 35 mm camera at approximately 3000' altitude. RF of 1:21000.

Filter.—Only one filter, a medium yellow (Wratten K-2) was used in the flights made. Other filters could be used to great advantage with this or other types of film for special effect.

Aperture and shutter speed.—Most of the flights were made during bright clear days. Usually a 1/200 shutter speed and a diaphragm opening of 4 was used. The required setting can be determined either on the ground or after the flight is underway. If the light conditions on the ground before takeoff are similar to the conditions at the area being photographed then the Kodak Neutral Test Card (gray board) gives good results. A patch of grass can also be used. If light conditions are determined from the aircraft then the diaphram opening, as determined from the meter, should be increased one stop. No changes need be made in the settings after the photographing is begun unless clouds are encountered. The focus is always set at infinity.

Camera mount.—It would be impossible to obtain acceptable coverage without an aid for orienting the camera in a vertical position. Several methods were tried before a mount was developed that produced the desired results. The mount that proved to be very successful was made of wood and is shown in Figure 2. This mount is made to rest on the window sills of the Piper J3 airplane when the right window is opened and locked in a down position. The camera is mounted so that when the aircraft is in level flight the camera is oriented for a vertical shot. It is located on the mount in such a way that it is easily accessible to the photographer and the view recorded by the camera is unobstructed. The plane speed is slow enough so that the slip stream does not interfere with the camera operation. The mount is hinged so that the camera may be brought into the cabin for reloading film. No attempt is made to use the camera viewfinder in flight. An open type sight could be easily designed but a sight is not necessary in obtaining the proper endlap and sidelap.

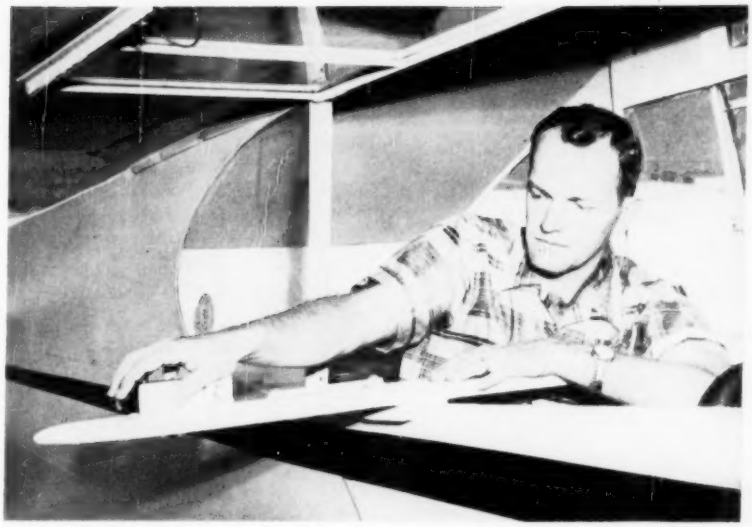


Fig. 2.—Camera mount in operative position.

Other types of mounts may be devised but the type shown here required no modification of the plane and gives good results. The window must be kept open during photographic runs but this should not affect the results. Several flights were made during cold weather in December and January without any extreme discomfort to the pilot or photographer. If modifications are to be made to the plane a very suitable camera mount with an attached viewfinder in the bottom of the plane could be devised.

Aircraft.—The Piper-J3 aircraft with a 65 hp engine was used. This plane has maneuverability, low minimum speed, inexpensive operation, and is usually available for rental. However, it is limited by the low operating ceiling, slow maximum speed and lack of instruments. Another type of light plane with greater top speed and high operating ceiling would be better suited to this purpose. The J3 is perhaps to be preferred if no modification is to be made to the plane for mounting the camera. The tandem seating allows maximum visibility to both pilot and photographer and the window arrangement permits the use of the camera mount illustrated.

Flight procedure.—Procedure followed in obtaining coverage is quite simple. If the photographer is familiar with the area no reconnaissance is necessary. If he is not familiar, however, a ground reconnaissance should be made to locate features that could be used for flight orientation. Flight lines should be drawn on a planimetric map of the area in the direction that offers the most cultural features for navigational purposes. The distance between adjacent flight lines is determined by the flying height, and are shown in Table 1. Time laps between exposures as determined by ground speed is also shown in Table 1. An experienced pilot can fly the required flight lines without difficulty and the photographer can master the technique of directing without difficulty.

Dark room procedure.—It is not necessary that a private dark room be used, but if one is available, more latitude is possible in photographic manipulation. All factors to be controlled are simply a part of good dark room procedure. The work can be carried out by commercial establishments but fine grain work must be requested.

The enlargement can be made to almost any reasonable scale, but a

TABLE 1.—FLIGHT LINE SEPARATIONS AND EXPOSURE INTERVALS FOR 35 MM CAMERAS OF 50 MM FOCAL LENGTH[1]

Altitude (Feet)	Flight line separation for 30 percent side-lap (Feet)	For interval in seconds between exposures for achieving 60 percent overlap										
		Ground speed—miles per hour										
		40	50	60	70	80	90	100	125	150	175	200
1,000	503	3	2	2	1	1	1	1	1	.8	.7	.6
2,000	1,006	6	5	4	3	3	2	2	2	1	1	1
3,000	1,509	10	7	6	5	4	4	3	3	2	2	1
4,000	2,012	13	10	8	7	6	5	5	4	3	3	2
5,000	2,515	17	13	10	9	8	7	6	5	4	3	3
6,000	3,018	20	15	13	11	9	8	7	6	5	4	3
7,000	3,521	23	18	15	13	11	10	9	7	6	5	4
8,000	4,024	27	20	17	14	13	11	10	8	6	6	5
9,000	4,527	30	23	19	16	14	13	11	9	7	6	5
10,000	5,030	34	25	22	18	16	14	13	10	8	7	6
15,000	7,545	51	39	32	28	24	21	19	15	13	11	9
20,000	10,060	60	52	43	37	32	29	26	20	17	15	13

[1]Hill, Harold J. The application of Vertical 35 mm Aerial Photography to Forest Management. Unpublished thesis, University of Florida. August 1957.

five diameter enlargement will ordinarily be sufficient.

Discussion

The adaptability of aerial photographs makes it impossible to list all of the ways that 35 mm coverage could be applied in forestry. This type of coverage can be used in many of the ways that conventionally obtained coverage is used in forestry work. It is especially suited for work on smaller areas. It can be used for timber type mapping, road location, location of harvesting operations, instructions to field crews, fire line location, record of operations, and many other activities. For some purposes, the coverage obtained in this way is even more useful than conventional photography because of the large scale that is possible and because of the short time lag required for delivery of finished photographs. Fire damage appraisal, progress of harvesting operation, progress of site preparation activities, rapid area determination, and rapid reconnaissance are but a few of the uses for such photographs. There are also a number of special uses to which 35 mm coverage could be adapted. For example they could be used for making a census of wildlife, as a record of changes in the forest area, and as a supplement to outdated-conventional photography.

Coverage of relatively small areas obtained in the manner described has a number of advantages. The more important of these are listed below.

1. Current information available. Desired coverage can be obtained and delivered in finished form in a minimum amount of time. The usual waiting, flight and processing time can be reduced thus making the information available when it is needed and useful. Because of the low cost involved, the coverage can be obtained when desired without having to wait for a specific season so that the photographs might be useful for other purposes.

2. Small area coverage reasonable in cost. It is often impossible to justify the per acre cost of having a smaller outlying area photographed. This method makes it economically feasible in smaller areas.

3. No compromise on scale or tonal quality. The low cost makes it possible to obtain the exact scale and tonal quality that may be desired for a specific purpose. It is not necessary that the coverage obtained be adequate for several different purposes and consequently not entirely adequate for any specific purpose. Additional coverage can be obtained when desired.

4. Opportunity of variation allowed. The variation of several factors permits the forester the opportunity of producing results that have not been attempted before. This makes advancement possible by experimentation on the part of the person utilizing the photographs.

5. Inexpensive to carry out. A test flight was made to determine the cost of securing coverage of 2,900 acres. The area was rectangular in shape and about twenty miles from the air strip. Finished prints were delivered within three days at a total cost of less than one cent per acre, including plane (with pilot) rental.

6. Low equipment investment. Almost all of the items of equipment necessary for obtaining coverage in this manner are useful for other purposes. In many cases the major items are already on hand. If it is necessary to purchase the equipment, the cost is not excessive.

7. Weather advantage. Weather is not the severe limiting factor that it is for ordinary aerial photographic work for several reasons. Good weather need not hold for a long period since light planes, suitable for the work, are available in almost all areas. It is possible to take advantage of short breaks in the weather since the time necessary for reaching the area to be photographed is much shorter. The weather need not be as perfect since the financial risk is not nearly so great because of the low-cost 35 mm technique.

Summary

Thirty-five mm vertical aerial photography cannot be used in all situations but in many others it makes it possible for foresters to realize more fully the advantage of photographic interpretation and provides opportunity for experimentation in this field.

Statistics from Schools of Forestry for 1958: Degrees Granted and Enrollments

Gordon D. Marckworth

This article is another in a series of comparable papers appearing annually in the JOURNAL OF FORESTRY *since 1934, reporting the enrollment at the schools of forestry and the numbers of degrees conferred. Statistics of this type were first assembled when the Forest Education Inquiry made its study in 1929-1931, and were published in the Inquiry's report of 1932.*[1] *The annual articles in the* JOURNAL *have brought to date the figures for each successive year.*[2]

THE INCREASE in undergraduate enrollment which began in the 1953-1954 scholastic year has continued this year and totals nearly 6½ percent, increasing from 7,395 to 7,866. This is the largest enrollment since the fall of 1948 which totaled 8,212. All classes except the junior show an increase in enrollment (Table 6).

Once again *general forestry* accounts for two-thirds of the enrollment in the junior and senior classes; *wildlife management* ranks second with 11 percent and *wood technology and utilization* follows with approximately 6½ percent.

The master candidates increased from 500 to 537 and the candidates for the doctorate from 179 to 209. Of the total graduate enrollment of 746, 52 percent are in *general forestry;* 17 percent in *wildlife management;* and 10 percent in *wood technology and utilization.*

The number of bachelor degrees granted increased from 1,172 in 1957 to 1,367 in 1958 of which 898 were in *general forestry,* 107 in *wood technology and utilization,* and 111 in *wildlife management.*

The number of master degrees granted increased from 207 to 230 of which 139 were in *general forestry,* 32 in *wood technology and utilization,* and 33 in *wildlife management.*

The number of doctor degrees granted decreased from 48 to 39 of which 16 were in *general forestry,* 9 in *wood technology and utilization* and 11 in *wildlife management.*

From 1900 through 1958 there have been 26,789 undergraduate forestry degrees granted in the United States. In addition 4,797 master degrees and 490 doctor degrees have been granted (Table 10).

Introduction

The 1958 statistics from the schools of forestry in the United States are on the same basis as for 1957, except that Clemson Agricultural College, the University of Illinois, and the Southern Illinois University have been added to the non-accredited group. This has increased the number of non-accredited schools from 10 to 13.

In has been customary to carry the statistics on the number of degrees granted on a calendar year basis and since the reports are requested in October, the schools operating on a quarter basis have to estimate the number of degrees which will be granted at the end of the autumn quarter. It thus becomes necessary to correct these estimates at the end of the year. For this reason the totals listed for 1957 in the current compilation are slightly different from those listed last year.

The statistics on degrees granted and enrollment of graduate students were first broken down by specialized curricula in 1953. In 1954 this breakdown was extended to the enrollment of undergraduate students in the junior and senior classes. At that time it was found that there was little segregation during the first two years and a breakdown of the enrollment in those classes would be virtually impossible.

The same five broad classes used for the past five years have been used again this year. These are *general forestry, wood technology and utilization, range management,* and *forest recreation.* Those curricula falling outside of these broad

THE AUTHOR is dean of the College of Forestry, University of Washington, Seattle.

[1]Graves, H. S. and C. H. Guise. Forest education. Yale Univ. Press, New Haven.

[2]Guise, C. H. (Eighteen articles on degrees granted and enrollments at schools of forestry in the United States, 1934-1950). Jour. Forestry 32:337-343; 33:402-405; 34:114-120; 35:77-83; 36:12-18; 37:197-202; 38:241-246; 39:359-364; 40:196-202; 41:87-91; 42:357-360; 43:172-175; 41:110-114; 45:174-180; 46:168-173; 47:93-100; 48:165-169; 49:7-12.

Marckworth, Gordon D. Jour. Forestry 50:262-265; 51:256-259; 52:354-358; 53:256-261; 54:316-321; 55:115-121; 56:129-135.

TABLE 1.—SIGNIFICANT STATISTICS FOR 1951 THROUGH 1958

	1951	1952	1953	1954	1955	1956	1957	1958
Bachelor's degrees conferred	1,564	1,267	1,045	957	829	887	1,172	1,367
Master's degrees conferred	267	226	151	179	194	233	207	230
Doctor's degrees conferred	21	25	37	44	31	34	48	39
Undergraduates enrolled	4,799	4,691	4,909	5,357	6,038	6,933	7,395	7,866
Members of freshman class	1,370	1,536	1,698	1,986	2,149	2,220	2,230	2,516
Members of sophomore class	1,107	1,012	1,168	1,377	1,566	1,807	1,831	1,860
Members of junior class	1,053	1,013	917	1,032	1,236	1,549	1,759	1,718
Members of senior class	1,269	1,130	1,126	962	1,087	1,357	1,575	1,772
Graduate students—master's	344	281	349	423	405	430	500	537
Graduate students—doctor's	137	130	139	127	161	165	179	207

TABLE 2.—BACHELOR DEGREES GRANTED FOR COMPLETION OF STUDIES IN SPECIALIZED FIELDS AT SCHOOLS OF FORESTRY IN THE UNITED STATES—CALENDAR YEARS 1957 AND 1958

	General forestry		Wood technology		Range management		Wildlife management		Forest recreation		Others		Totals	
	1957	1958	1957	1958	1957	1958	1957	1958	1957	1958	1957	1958	1957	1958
Accredited schools														
Alabama	20	19	—	1	—	—	—	—	—	—	—	—	20	20
California	32	31	—	—	—	—	—	—	—	—	—	—	32	31
Colorado	12	15	12	10	7	17	15	25	10	10	—	5	56	82
Florida	16	18	1	—	—	—	—	1	—	—	—	—	17	19
Georgia	44	54	—	—	—	—	8	3	—	—	—	—	52	57
Idaho	19	42	4	—	4	6	2	3	—	—	2	3	31	54
Iowa	8	21	21	7	4	—	—	—	—	—	—	—	33	28
Louisiana Poly. Inst.	14	22	—	—	—	—	—	—	—	—	—	—	14	22
Louisiana State	25	29	—	—	—	—	—	—	—	—	—	—	25	29
Maine	27	34	—	—	—	—	13	9	—	—	—	—	40	43
Massachusetts	18	8	—	—	—	—	3	5	—	—	—	—	21	13
Michigan Mining	32	21	—	—	—	—	—	—	—	—	—	—	32	21
Michigan State	28	37	4	6	—	—	22	18	7	6	88	119	149	186
Michigan Univ.	21	26	4	2	—	—	8	8	—	—	5	6	38	42
Minnesota	37	38	3	—	—	—	5	3	—	—	7	9	52	50
Missouri	26	28	—	—	—	—	—	—	—	—	—	6	26	34
Montana	27	31	3	9	3	—	—	1	—	—	—	—	33	41
New York	52	37	25	28	—	—	—	—	—	—	25	29	102	94
North Carolina	26	26	8	6	—	—	—	—	—	—	4	9	38	41
Oregon	45	54	3	9	—	—	—	—	—	—	—	—	48	63
Pennsylvania	48	60	6	8	—	—	—	—	—	—	—	—	54	68
Purdue	34	24	4	4	—	—	—	—	—	—	—	—	38	28
Utah	9	22	—	—	13	21	18	12	—	—	—	—	40	55
Washington Univ.	30	33	7	13	—	—	—	—	—	—	—	—	37	46
West Virginia	18	21	8	4	—	—	5	8	—	—	—	—	31	33
Total	668	751	113	107	31	44	99	96	17	16	131	186	1,059	1,200
Schools not accredited														
Arkansas	12	15	—	—	—	—	—	—	—	—	—	—	12	15
Connecticut	9	8	—	—	—	—	3	7	—	—	—	—	12	15
Illinois Univ.	—	—	—	—	—	—	1	—	—	—	—	—	1	—
Mississippi	16	37	—	—	—	—	—	—	—	—	—	—	16	37
New Hampshire	2	11	—	—	—	—	2	3	—	—	—	—	4	14
Oklahoma	29	28	—	—	—	—	—	—	—	—	—	—	29	28
Rutgers	4	4	—	—	—	—	—	—	—	—	—	—	4	4
Texas (S. F. Austin)	4	11	—	—	—	—	—	—	—	—	—	—	4	11
Univ. of the South	3	4	—	—	—	—	—	—	—	—	—	—	3	4
Virginia Poly. Inst.	15	10	—	—	—	—	—	—	—	—	—	—	15	10
Washington State	9	19	—	—	—	—	3	5	—	—	1	5	13	29
Total	103	147	—	—	—	—	9	15	—	—	1	5	113	167
Grand total	771	898	113	107	31	44	108	111	17	16	132	191	1,172	1,367

classes have been grouped under the heading *others*.

Each of these classes was described for 1953 (Jour. Forestry 52:354-358) and 1954 (Jour. Forestry 53:256-261), and again for 1957 (Jour. Forestry 56:129-135).

Degrees Granted

During the calendar year 1958 the 37 schools of forestry awarded an estimated 1,367 undergraduate degrees, 230 master degrees, and 39 doctor degrees. Of the undergraduate degrees 1,200 or 88 percent were awarded by the accredited schools, compared to 1,068 or 91 percent in 1957.

Looking at the breakdown of the undergraduate degrees in the specialized fields, we find that 898 or 66 percent were in the field of *general forestry*. This compares to 66 percent in 1957; and 68 percent in 1956 (Table 2). *Wildlife management* ranked second with 9 percent and *wood technology and utilization* followed with 8 percent, while *others* accounted for 14 percent, an increasing number as noted last year.

The estimated number of master degrees granted in 1958 totaled 230, an increase of 23 from last years 207. *General forestry* accounted for 139 or 60 percent. *Wildlife management* ranked second with 33 or 14 percent and *wood technology and utilization* a close third with 32. Of the 230 master degrees granted 224 were granted by the accredited schools (Table 3).

The estimated number of doctor degrees granted this year decreased from 48 in 1957 to 39. The largest number (41 percent) were in *general forestry* and were granted by seven accredited schools (Table 4).

Undergraduate Enrollment

After an all time high of 8,212 in the fall of 1948, undergraduate enrollment dropped to 4,691 in 1952. Since that date it has increased, and totaled 7,866 this year. The total increase this year is 471 compared to 462 last year and 895 the year before (Tables 5 and 6).

All classes except the juniors show an increase in enrollment. The freshman increase jumped from 10 to 286 while the sophomore rose from 24 to 29. The senior increase rose from 197 to 218 and the junior class changed from an increase of 210 to a decrease of 41.

Looking at this breakdown by specialized curricula we find that

TABLE 3.—MASTER DEGREES GRANTED FOR COMPLETION OF STUDIES IN SPECIALIZED FIELDS AT SCHOOLS OF FORESTRY IN THE UNITED STATES—CALENDAR YEARS 1957 AND 1958

	General forestry		Wood technology		Range management		Wildlife management		Forest recreation		Others		Totals	
	1957	1958	1957	1958	1957	1958	1957	1958	1957	1958	1957	1958	1957	1958
Accredited schools														
Alabama	—	2	—	—	—	—	—	—	—	—	—	—	—	2
California	8	4	—	—	1	—	—	—	—	—	—	—	9	4
Colorado	1	6	—	—	2	—	6	8	1	—	—	—	10	14
Duke	7	16	3	3	—	—	—	—	—	—	—	—	10	19
Florida	2	—	1	—	—	—	1	—	—	—	—	—	4	—
Georgia	4	2	—	—	—	—	1	1	—	—	—	—	5	3
Idaho	2	3	—	—	2	—	3	3	—	—	2	1	9	7
Iowa	1	2	1	2	—	—	—	—	—	—	—	1	2	5
Louisiana State	4	6	—	1	—	—	6	2	—	—	—	—	10	9
Maine	—	1	—	—	—	—	—	1	—	—	—	—	—	2
Michigan State	10	12	—	—	—	—	4	5	—	—	5	9	19	26
Michigan Univ.	13	9	6	3	—	—	2	4	—	—	10	6	31	22
Minnesota	3	5	2	—	—	—	—	—	—	—	1	—	6	5
Missouri	—	1	—	—	—	—	—	—	—	—	—	—	—	1
Montana	3	—	—	1	—	—	1	1	—	—	—	—	4	2
New York	17	10	6	10	—	—	—	—	—	—	1	3	24	23
North Carolina	3	3	2	2	—	—	—	—	—	—	—	—	5	5
Oregon	5	19	—	2	—	—	—	—	—	—	—	—	5	21
Pennsylvania	2	3	1	—	—	—	1	—	—	—	—	—	4	3
Purdue	1	2	—	—	—	—	—	—	—	—	1	1	2	3
Utah	1	1	—	—	3	5	4	5	—	—	—	—	8	11
Washington Univ.	6	6	2	1	—	—	—	—	—	—	—	—	8	7
Yale	23	25	6	5	—	—	—	—	—	—	—	—	29	30
Total	116	138	30	30	8	5	29	30	1	—	20	21	204	224
Schools not accredited														
New Hampshire	—	1	—	—	—	—	—	—	—	—	—	—	—	1
Virginia Poly. Inst.	—	—	—	—	—	—	2	3	—	—	—	—	2	3
Washington State	—	—	1	2	—	—	—	—	—	—	—	—	1	2
Total	—	1	1	2	—	—	2	3	—	—	—	—	3	6
Grand total	116	139	31	32	8	5	31	33	1	—	20	21	207	230

69 percent of the junior and 65 percent of the senior enrollment was accounted for by those majoring in *general forestry* (Table 7). These percentages are approximately the same as they have been for the past several years. In other words, approximately two-thirds of the undergraduate enrollment continues in *general forestry*. It would also indicate that the bachelor degrees granted during the next two years will continue to account for two-thirds of the total.

Wildlife management ranks second, as it did last year, with 10.6 percent of the junior class and 11.5 percent of the senior class. *Wood technology and utilization* follows with 5.7 and 7.5 percent in the junior and senior classes respectively.

Trends in enrollment are always confused by many factors, and predictions are hazardous at best. Three years ago trends indicated an increase in 1956 of 10 percent but actually totaled 15 percent. The trends for 1957 indicated an increase of 12 percent, but showed an increase of only 7 percent. Last year the trends for this year indicated a net increase of 3 percent,

TABLE 4.—DOCTOR DEGREES GRANTED FOR COMPLETION OF STUDIES IN SPECIALIZED FIELDS AT SCHOOLS OF FORESTRY IN THE UNITED STATES—CALENDAR YEARS 1957 AND 1958

	General forestry		Wood technology		Range management		Wildlife management		Forest recreation		Others		Totals	
	1957	1958	1957	1958	1957	1958	1957	1958	1957	1958	1957	1958	1957	1958
Accredited schools														
California	1	—	—	—	—	—	—	—	—	—	—	—	1	—
Duke	4	2	1	1	—	—	—	—	—	—	—	—	5	3
Iowa	1	—	—	—	—	—	—	—	—	—	—	—	1	—
Michigan State	3	2	—	—	—	—	1	3	—	—	1	—	5	5
Michigan Univ.	2	1	—	—	—	—	1	1	—	—	4	3	7	5
Minnesota	1	2	2	—	—	—	—	—	—	—	—	—	3	2
New York	8	4	7	7	—	—	—	—	—	—	—	—	15	11
North Carolina	—	—	—	1	—	—	—	—	—	—	—	—	—	1
Utah	—	—	—	—	1	—	—	5	—	—	—	—	1	5
Washington Univ.	—	1	—	—	—	—	—	—	—	—	—	—	—	1
Yale	6	4	4	—	—	—	—	—	—	—	—	—	10	4
Total	26	16	14	9	1	—	2	9	—	—	5	3	48	37
School not accredited														
Virginia Poly.	—	—	—	—	—	—	—	2	—	—	—	—	—	2
Grand total	26	16	14	9	1	—	2	11	—	—	5	3	48	39

TABLE 5.—ENROLLMENT BY CLASSES AT SCHOOLS OF FORESTRY IN THE UNITED STATES FOR THE FALL TERM 1958-1959

	Freshmen	Sophomore	Junior	Senior	Total undergraduate	Graduates Master	Graduates Doctor
Accredited schools							
Alabama	80	50	46	28	204	2	—
California	12	20	37	43	112	23	29
Colorado	218	128	81	90	517	28	—
Duke	—	—	—	—	—	50	11
Florida	50	35	16	20	121	6	—
Georgia	67	92	80	90	329	9	—
Idaho	77	61	58	63	259	20	—
Iowa	67	54	56	52	229	6	2
Louisiana Polytechnic Inst.	52	26	15	25	118	—	—
Louisiana State	47	12	26	40	125	19	—
Maine	75	57	58	45	235	5	—
Massachusetts	30	20	24	30	104	7	—
Michigan Mining	66	44	17	22	149	—	—
Michigan State	155	126	165	216	662	56	20
Michigan University	19	27	53	49	148	31	41
Minnesota	99	112	64	70	345	22	11
Missouri	48	29	41	43	161	5	—
Montana	117	75	61	82	335	20	—
New York	157	121	104	104	486	72	44
North Carolina	100	82	74	74	330	17	6
Oregon	73	96	96	84	349	16	3
Pennsylvania	119	86	77	80	362	2	—
Purdue	50	37	37	47	171	13	3
Utah	141	95	100	94	430	34	8
Washington University	85	55	59	57	256	11	14
West Virginia	72	56	52	24	204	—	—
Yale	—	—	—	—	—	43	11
Total	2,076	1,596	1,497	1,572	6,741	517	203
Schools not accredited							
Arkansas	49	32	23	23	127	—	—
Clemson Agric. College	43	42	10	9	104	—	—
Connecticut	18	10	18	17	63	5	—
Illinois University	21	17	8	2	48	—	—
Southern Illinois	38	13	6	—	57	—	—
Mississippi	66	45	38	28	177	—	—
New Hampshire	23	14	16	20	73	2	—
Oklahoma	25	26	32	31	114	—	—
Rutgers	15	12	13	10	50	—	—
Texas (S. F. Austin)	40	17	12	15	84	—	—
University of the South	11	7	6	3	27	—	—
Virginia Polytechnic Inst.	47	11	9	7	74	7	2
Washington State	44	18	30	35	127	6	2
Total	440	264	221	200	1,125	20	4
Grand total	2,516	1,860	1,718	1,772	7,866	537	207

TABLE 6.—UNDERGRADUATE FALL TERM ENROLLMENTS BY CLASSES IN SCHOOLS OF FORESTRY IN THE UNITED STATES FOR THE YEARS 1944-1945 THROUGH 1958-1959

Academic years	—Freshmen— Enrollment	Change	—Sophomores— Enrollment	Change	—Juniors— Enrollment	Change	—Seniors— Enrollment	Change	——Totals—— Enrollment	Change
1944-1945	321	+ 122	114	+ 20	64	— 37	72	— 37	571	+ 68
1945-1946	840	+ 519	315	+ 201	205	+141	113	+ 41	1,473	+ 902
1946-1947	3,611	+2,771	1,840	+1,525	914	+709	645	+532	7,010	+5,537
1947-1948	2,061	—1,550	2,878	+1,038	1,577	+663	938	+293	7,454	+ 444
1948-1949	1,851	— 210	2,178	— 700	2,497	+920	1,686	+748	8,212	+ 758
1949-1950	1,485	— 366	1,667	— 511	1,816	—681	2,501	+815	7,469	— 743
1950-1951	1,442	— 43	1,379	— 288	1,384	—432	1,730	—771	5,935	—1,534
1951-1952	1,370	— 72	1,107	— 272	1,053	—331	1,269	—461	4,799	—1,136
1952-1953	1,536	+ 166	1,012	— 95	1,013	— 40	1,130	—139	4,691	— 108
1953-1954	1,698	+ 162	1,168	+ 156	917	— 96	1,126	— 4	4,909	+ 218
1954-1955	1,986	+ 288	1,377	+ 209	1,032	+115	962	—164	5,357	+ 448
1955-1956	2,149	+ 163	1,566	+ 189	1,236	+204	1,087	+125	6,038	+ 681
1956-1957	2,220	+ 71	1,807	+ 241	1,549	+313	1,357	+270	6,933	+ 895
1957-1958	2,230	+ 10	1,831	+ 24	1,759	+210	1,575	+218	7,935	+ 462
1958-1959	2,516	+ 286	1,860	+ 29	1,718	— 41	1,772	+197	7,866	+ 471

TABLE 7.—ENROLLMENT OF JUNIOR AND SENIOR STUDENTS IN SPECIALIZED FIELDS AT SCHOOLS OF FORESTRY IN THE UNITED STATES FOR THE FALL TERM 1958-1959

	General forestry		Wood technology		Range management		Wildlife management		Forest recreation		Others		Totals	
	Jr.	Sr.	Jr.	Sr.	Jr.	Sr.	Jr.	Sr.	Jr.	Sr.	Jr.	Sr.	Jr.	Sr.
Accredited schools														
Alabama	40	26	6	2	...	...	...	...	...	...	...	...	46	28
California	35	41	...	...	2	2	...	...	...	...	...	...	37	43
Colorado	23	33	3	6	25	13	25	24	5	14	...	...	81	90
Florida	14	15	...	2	...	...	2	3	...	...	...	...	16	20
Georgia	76	83	...	...	...	...	4	7	...	...	...	...	80	90
Idaho	37	36	...	...	8	9	8	12	...	...	5	6	58	63
Iowa	48	38	8	12	...	2	...	...	...	...	...	...	56	52
Louisiana Poly. Inst.	15	25	...	...	...	...	...	...	...	...	...	...	15	25
Louisiana State	26	40	...	...	...	...	...	...	...	...	...	...	26	40
Maine	42	34	...	...	...	...	16	11	...	...	...	...	58	45
Massachusetts	14	20	...	...	...	...	10	10	...	...	...	...	24	30
Michigan Mining	17	22	...	...	...	...	...	...	...	...	...	...	17	22
Michigan State	53	54	3	2	...	...	35	29	2	5	72	126	165	216
Michigan Univ.	29	24	8	5	...	...	10	13	...	...	6	7	53	49
Minnesota	34	33	4	2	...	...	19	28	...	...	7	7	64	70
Missouri	34	42	...	...	...	...	...	...	...	...	7	1	41	43
Montana	43	59	6	9	11	8	1	6	...	...	...	...	61	82
New York	39	48	22	21	...	...	...	...	...	...	43	35	104	104
North Carolina	40	45	11	17	...	...	...	...	...	...	23	12	74	74
Oregon	91	66	5	18	...	...	...	...	...	...	...	...	96	84
Pennsylvania	73	61	1	12	...	...	...	...	...	...	3	7	77	80
Purdue	34	40	3	7	...	...	...	...	...	...	...	...	37	47
Utah	43	37	...	...	25	23	32	34	...	...	...	...	100	94
Washington Univ.	49	48	10	9	...	...	...	...	...	...	...	...	59	57
West Virginia	38	14	7	6	...	...	7	4	...	...	...	...	52	24
Total	987	984	97	130	71	57	169	181	7	19	166	201	1,497	1,572
Schools not accredited														
Arkansas	23	23	...	...	...	...	...	...	...	...	...	...	23	23
Clemson	10	9	...	...	...	...	...	...	...	...	...	...	10	9
Connecticut	13	10	...	...	...	...	5	7	...	...	...	...	18	17
Illinois	7	...	1	...	...	...	...	2	...	...	...	...	8	2
Southern Illinois	6	...	...	...	...	...	...	...	...	...	...	...	6	...
Mississippi	38	28	...	...	...	...	...	...	...	...	...	...	38	28
New Hampshire	14	14	...	...	...	...	2	6	...	...	...	...	16	20
Oklahoma	32	31	...	...	...	...	...	...	...	...	...	...	32	31
Rutgers	13	10	...	...	...	...	...	...	...	...	...	...	13	10
Texas (S. F. Austin)	12	15	...	...	...	...	...	...	...	...	...	...	12	15
Univ. of South	6	3	...	...	...	...	...	...	...	...	...	...	6	3
Virginia Poly. Inst.	9	7	...	...	...	...	...	...	...	...	...	...	9	7
Washington State	20	23	...	...	2	3	7	8	...	...	1	1	30	35
Total	203	173	1	...	2	3	14	23	...	...	1	1	221	200
Grand total	1,190	1,157	98	130	73	60	183	204	7	19	167	202	1,718	1,772

but the actual increase was 6½ percent.

In analyzing past statistics we find that the enrollment of the senior class has not followed the expected trends, for each year since 1951 it has been larger than the preceding junior class. As a matter of fact, in 10 of the past 12 years the senior class has been larger than the preceding junior class. There is nothing in past enrollment figures to indicate why this is true.

If present trends continue, the undergraduate enrollment in the fall of 1959 should approach the 1948 all-time high of 8,212.

The enrollment of undergraduate women students continues small, totalling 21 this year compared to 20 in 1956 and 1957 (Table 8).

Graduate Enrollment

The graduate enrollment is confined to 24 accredited and 4 non-accredited schools. The enrollment for the master degree has increased from 500 to 537, and the doctorate

TABLE 8.—FALL TERM ENROLLMENT OF WOMEN IN SCHOOLS OF FORESTRY IN THE UNITED STATES FOR THE YEARS 1943 THROUGH 1958

	Freshmen	Sophomore	Junior	Senior	Total undergraduates	Graduates	
						Masters	Doctors
1943	2	..	1	4	7	..	..
1944	5	5	..	1	11	1	..
1945	5	6	5	..	16	1	..
1946	5	5	4	4	18	..	1
1947	1	1	3	4	9	..	..
1948	1	3	1	4	9	2	..
1949	1	1	2	2	6	1	..
1950	2	..	1	4	7	1	1
1951	..	4	..	1	5	..	1
1952	5	2	3	..	10	1	1
1953	8	5	..	3	16	..	..
1954	7	6	3	1	17	2	..
1955	4	5	6	3	18	5	1
1956	8	3	5	4	20	4	5
1957	7	4	5	4	20	4	1
1958	9	7	1	4	21	6	3

TABLE 9.—ENROLLMENT OF GRADUATE STUDENTS IN SCHOOLS OF FORESTRY IN THE UNITED STATES FOR THE FALL TERM 1957-1958

Accredited schools	General forestry		Wood technology		Range management		Wildlife management		Forest recreation		Others		Totals	
	MS	Dr.	MS	Dr.	MS	Dr.	MS	Dr.	MS	Dr.	MS	Dr.	MS	Dr.
Alabama	1		1										2	
California	21	23	2			6							23	29
Colorado	6				6		14		2				28	
Duke	36	11	14										50	11
Florida	5						1						6	
Georgia	7						2						9	
Idaho	8		1		4		6				1		20	
Iowa	3	1	2	1							1		6	2
Louisiana State Univ.	14		2				3						19	
Maine	2						3						5	
Massachusetts							7						7	
Michigan State	10	10	3				21	7	3		19	3	56	20
Michigan Univ.	10	16	1	1			6	5			14	19	31	41
Minnesota	20	10	1	1							1		22	11
Missouri	5												5	
Montana	12		1				5		1		1		20	
New York	41	11	17	32							14	1	72	44
North Carolina	10	2	7	4									17	6
Oregon	12	3	4										16	3
Pennsylvania	1		1										2	
Purdue	8	1		1			1	1			4		13	3
Utah	6				6	4	22	4					34	8
Washington	9	14	2										11	14
Yale	39	6	4	5									43	11
Total	286	108	63	45	16	10	91	17	6		55	23	517	203
Schools not accredited														
Connecticut							5						5	
New Hampshire	2												2	
Virginia Poly. Inst.							7	2					7	2
Washington State							6	2					6	2
Total	2						18	4					20	4
Grand total	288	108	63	45	16	10	109	21	6		55	23	537	207

TABLE 10.—NUMBER OF DEGREES GRANTED FOR COMPLETION OF STUDIES AT SCHOOLS OF FORESTRY IN THE UNITED STATES FOR THE CALENDAR YEARS 1900-1958

Years	Undergraduate degrees	Master's degrees	Doctor's degrees
1900	1		
1901	5		
1902	2	9	
1903	3	14	
1904	9	29	
1905	9	34	
1906	24	24	
1907	19	27	
1908	31	35	
1909	47	44	
1910	61	48	
1911	100	61	
1912	122	54	
1913	136	37	
1914	151	42	
1915	124	35	
1916	151	36	
1917	160	27	
1918	65	10	
1919	53	6	
1920	160	25	
1921	126	26	
1922	141	44	
1923	217	31	
1924	215	43	
1925	280	44	
1926	259	58	
1927	263	50	
1928	302	64	
1929	291	54	
1930	308	69	
1931	394	97	(34)[1]
1932	380	78	7
1933	355	65	6
1934	337	47	6
1935	423	58	8
1936	502	67	9
1937	803	75	7
1938	980	95	5
1939	1,102	112	8
1940	1,072	105	9
1941	834	117	12
1942	654	76	13
1943	446	28	6
1944	106	12	3
1945	51	18	7
1946	192	65	8
1947	553	223	7
1948	918	222	16
1949	1,443	205	12
1950	2,321	275	29
1951	1,564	267	21
1952	1,267	226	25
1953	1,045	151	37
1954	957	179	44
1955	829	194	31
1956	887	233	34
1957	1,172	207	48
1958	1,367	230	39
Total	26,789	4,797	491

[1]Total doctor's degrees granted prior to 1932. Break-down by years not available.

from 179 to 207 or a combined increase from 679 to 744. Of these 52 percent are in *general forestry;* 17 percent in *wildlife management;* and 10 percent in *wood technology and utilization.* The accredited schools account for 517 of the 537 master candidates and 203 of the 207 doctor candidates.

Among the accredited schools 286 of the 517 master candidates were enrolled in *general forestry,* 91 in *wildlife management,* and 63 in *wood technology and utilization.* Among the non-accredited schools out of a total of 20 candidates, 18 were in *wildlife management,* and 2 in *general forestry* (Table 9).

The enrollment for the doctorate in the accredited schools shows 108 in *general forestry,* 45 in *wood technology and utilization,* and 17 in *wildlife management* (Table 9).

Of the 744 graduate students enrolled throughout the nation only nine are women, six candidates for the master degree and three for the doctorate (Table 8).

Converting Scrub Oak Sandhills to Pine Forests in Florida

Frank W. Woods

WEST FLORIDA'S sandhills were once dominated by open stands on longleaf pine, usually averaging less than 4,000 board feet of merchantable timber per acre. For the past hundred years repeated cutting and indiscriminate woods burning have removed the pine and have prevented its re-establishment. As a result, the sandhills are almost completely occupied by worthless scrub oaks and wiregrass (Fig. 1).

During the past 5 years, the cooperative efforts of several organizations[1] have been combined in developing practical methods for restoring pine to these deep sandy scrub-oak lands. Many young plantations have been successfully established. Researchers have located one plantation, started as a project of the Future Farmers of America, that has grown satisfactorily for 15 years. However, areas must be properly prepared before planting. This article describes the cooperative research and presents some of the early results.

Landowners who are interested in plant control to improve range grazing or game foood will need to plan special measures such as seeded firebreaks for livestock grazing and food plantings for game. Consideration of such special measures is beyond the scope of this paper.

The Experimental Area

Sandhills research in west Florida has been concentrated on the Chipola Experimental Forest, 25 miles south of Marianna. It is a typical sandhills area representative of about 3 million acres in Florida and nearly 10 million acres throughout the Southeastern Coastal Plains.

The soils are mostly deep sands of the Lakeland series, having rapid internal drainage and poor water-holding capacity. Organic matter averages only 1 percent in the upper foot of soil. The moisture equivalent is as low as 3.5 percent, with the wilting range (retention at 15 atmospheres' pressure) often in the vicinity of 1.0 percent or less.

Preliminary tests indicated the need for eliminating competing vegetation before planting pines. Accordingly chemical, pyric, and mechanical methods of site preparation were studied.

Site Preparation Tests

Intensive studies have failed to reveal a chemical that will kill both scrub oaks (chiefly *Quercus laevis* Walt. and *Q. incana* Bartr.) and wiregrass (*Aristida stricta* Michx.) economically. Single-stem treatments of trees is costly and tends to release the wiregrass, which multiplies and becomes even more of a problem. For example, when oaks were controlled with a basal spray, survival of planted pines was poorer than when no treatment was used. In aerial applications, chemicals that were highly effective for deadening trees did an inadequate job on oak sprouts and did not kill wiregrass.

Fire kills the oaks, but the stumps sprout vigorously, resulting in an increased number of stems per acre. Nevertheless, root vigor is reduced during sprouting, and this phenomenon can be exploited. Wiregrass, which normally propagates vegetatively, produces flowers and seed after being burned and thus becomes more abundant than before.

Mechanical site preparation, with heavy machinery, has given consistently good results when the sites were completely denuded. Nothing short of complete eradication of scrub oaks and wiregrass will give satisfactory pine survival (Table 1).

Sites that were completely denuded with bulldozers or rootrakes gave the best survival. Furrowing with a Mathis fire plow has given

FIG. 1.—Scrub oaks and wiregrass dominate in west Florida's sandhills. They must be removed or killed if pines are to be re-established.

THE AUTHOR is assistant professor of silviculture, School of Forestry, Duke University. This paper describes work in which he participated while a member of the staff of the Southern Forest Experiment Station, Forest Service, U. S. Department of Agriculture, New Orleans, La.

[1]Florida Board of Forestry, Hardaway Contracting Co., St. Joe Paper Co., International Paper Co., three universities, several chemical companies and manufacturers of heavy equipment, and the East Gulfcoast Research Center of the Southern Forest Experiment Station.

TABLE 1.—SLASH PINE SEEDLING SURVIVAL AT AGE 3[1]

Method of site preparation	Survival
	Percent
Denuded (bulldozing, rootraking)	82
Furrowed (seedlings planted in furrows made by Mathis fire plow)	63
Burned (summer burn)	54
Harrowed (Rome disk harrow)	44
Check (no treatment)	40
Chemical control of oaks (basal spray)	36

[1]Basis: 80 plots, 15 acres, randomized block design, 4 blocks, 10 treatments. Treatment differences significant at 1-percent level.

good results in Georgia, South Carolina, and North Carolina, where the sandhills generally have a clay layer within several feet of the surface. The west Florida sandhills have no clay horizon near the surface. Here survival of seedlings planted in furrows has been distinctly inferior to that on denuded sites.

Soil Moisture Tests

As a supplement to the work just described, a study was installed to determine the role of soil moisture in seedling survival. Regular field moisture measurements were made for two years on sites that had been treated in four ways.

On one date, May 17, 1954, 13 days had passed since the last rain. The 3- to 9-inch horizon of the check and chemically treated plots had only 41 percent as much moisture as the bare plots (Table 2). Moisture in the furrows was only 61 percent of that in the bare plots. Spot checks on other dates showed a consistent relation between the intensity of site preparation, soil-moisture content during droughts, and pine survival. Good soil moisture means good survival.

Denuding Tests

With the knowledge that complete removal of all vegetation is necessary for satisfactory pine survival, a second large-scale site-preparation study was started. Some of the best known machines for denuding sites were used. These included an 11-ton tandem chopper,[2] a rootrake-scalper, and a heavy disk. Burned and untreated check plots were installed for comparison.

Survival and growth of pines after two growing seasons are shown in Table 3. All of the plots except the check area were given a hot summer burn before mechanical treatments were applied.

Growth was best on the double-chop treatment, probably because there was less soil displacement, the plant debris was left in place, and the wiregrass was completely killed. The chopper cut the woody and herbaceous vegetation into small pieces and drove it into the surface layer of soil—no organic matter was removed from site. The root-rake, on the other hand, removed much of the surface soil at the same time that it pushed trees, brush, and plant debris into windrows. The burn-only treatment shows very little difference from the untreated check.

Analyses showed the organic matter to be consistently higher in the chopped soils. The differences were small, but sandhills soils are notably infertile and even small differences may be critical.

[2]Manufacturer's name: Brush Cutter.

TABLE 2.—SOIL MOISTURE DURING DROUGHT PERIOD, AND SECOND-YEAR SLASH PINE SURVIVAL[1]

Site condition when planted	Soil moisture		Second-year slash pine survival
	Actual moisture	Moisture index[2]	
Bare	4.1	100	87
Furrowed	2.5	61	72
Check	1.7	41	47
Oaks basal-sprayed with chemical	1.7	41	42

[1]Basis: Gravimetric analyses of 16 randomized pairs of soil samples from 4 randomized treatment, in 2 blocks at 2 depth—4½ inches and 7½ inches.
[2]With moisture content of bare site taken as 100 percent.

TABLE 3.—SURVIVAL AND HEIGHT OF SLASH PINES TWO GROWING SEASONS AFTER BEING PLANTED ON SITES PREPARED BY SEVERAL METHODS[1]

Method of site preparation	Survival	Height	Productivity index (survival × height)
	Percent	*Feet*	*Percent*[2]
Double-chop[3]	83	3.4	100
Rootrake-disk[3]	83	2.4	71
Single chop	78	2.3	64
Rootrake	75	1.3	34
Hot summer burn only	63	1.2	27
Check	58	1.2	25

[1]Basis: 24 plots, 17 acres, randomized block design, 3 blocks, 8 treatments. Survival and height differences significant at 1-percent level.
[2]Percentages show relation to the double-chop treatment.
[3]An eight-week period elapsed between each chopping operation, as well as between rootraking and disking.

Timing of Clearing Operations

At least two choppings are absolutely necessary. The first one should come in late April or early May, immediately after the leaves are fully expanded. At this time carbohydrate root reserves are less than at any other season and resprouting vigor is low. Nevertheless, some sprouts will develop, individually and in clumps, so that it will be necessary to repeat the chopping at an interval of 6 to 8 weeks. In these experiments trees that had been chopped and rechopped had approximately ⅓ as much sprouting vigor and produced about ½ as many sprouts as undisturbed trees.

If pines are established promptly on a well-prepared site there should be no resprouting problem as long as a fully stocked stand is maintained. If oaks are allowed to regain a roothold, however, they will compete once more for soil moisture.

Planting

Sites prepared with either double-drum brush choppers or with root-rakes are excellent for machine planting and offer no spe-

FIG. 2.—Eleven-ton double-drum brush choppers have proven highly effective for site preparation in west Florida.

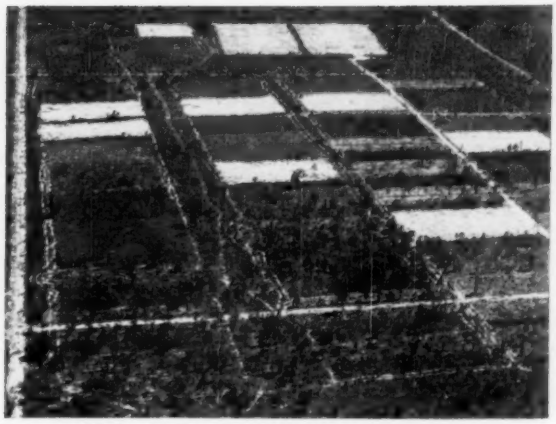


FIG. 3.—At the Chipola Experimental Forest, the various site treatments make a checkerboard pattern when seen from the air.

cial problems. The choppers cut limbs, trunks, and roots into short pieces, while rootrakes remove most of them from the planting site. In neither case do limbs or trunks of trees interfere with the coulter or packing wheels of the planting machine.

Pines should be planted the first planting season following site preparation. Otherwise weeds and sprouts may repossess the prepared areas.

Slash pine has produced the best all-around survival and growth in sandhills planting tests and no other species can be recommended at this time. Sand pine, longleaf, and loblolly show promise, and positive advice on these species should be available within a few years. Each of these pines has specific problems that must be resolved.

What can we expect sandhills land to produce? There is not enough information for a conclusive answer, but indications are that slash pine will make excellent growth for at least 15 years. For example, a plantation in Washington County has produced 1.5 cords per acre per year. This plantation was established on an old field in a typical sandhills site. A thinning at age 13 yielded 6 cords per acre, with 13 cords per acre left as growing stock. Young experimental plantations on land of the St. Joe Paper Co. in Liberty County are also making excellent growth. Four-year-old slash pines average over 6 feet in height, and sand pine growth is even better.

Costs

With a TD-24, D-8, or other tractor of equal drawbar horsepower, and a Marden B-7 brush cutter (chopper), approximately 1.6 acres of previously undisturbed scrub can be chopped in an hour. The same equipment can re-chop two acres an hour.

This means that in one hour, 0.9 acre of land can be prepared for planting. Actual costs, of course, will depend upon the size of the tract, eligibility for payments under the Agricultural Stabilization and Conservation Program, whether equipment is owned or rented, distance from the last job, taxes, and the like. Each case is unique and ultimate costs must be determined by the landowner or manager.

In several instances, operators have tried to use light farm equipment to clear sandhills land. This has not proven satisfactory. Invariably, the landowner has more sprouts per acre than before the treatments were made.

Summary

In summary, several things are evident:

Survival and growth of pine seedlings planted on west Florida sandhills are best on completely cleared sites, where available soil moisture is most abundant during critical dry periods.

On these sites a heavy double-drum brush chopper eradicates oaks and wiregrass better than any other method.

Clearing operations should begin in late April or early May, with the repeat treatment coming not less than 6 weeks later.

Slash pines should be planted the first planting season following the clearing operation.

Effect of Gibberellin on Conifers: Generally Negative

Arthur H. Westing

GIBBERELLIN IS A metabolic product of the fungus *Gibberella fujikuroi* (Saw.) Wr. Applications of this class of compounds have been shown to increase the growth rate of a wide variety of angiosperms and the final size of many of these. Such treatment in some cases also results in breaking of dormancy and in others in stimulation of flowering. The literature on the subject has reached vast proportions in recent years and the often spectacular effects of gibberellin on angiosperm growth and development are thus now common knowledge. Stowe and Yamaki (*11*) have reviewed the field through about the latter part of 1956.

The effect of gibberellin on conifers, however, has received somewhat less attention than might be expected in view of their botanical interest and commercial importance. It seems appropriate, therefore, to review this literature so that it may be evaluated for the purpose of guiding future work. This review draws only upon data published through March 1958 and is divided by species into (1) the stimulation of stem growth, (2) the stimulation of root growth, and (3) the initiation and cessation of vegetative growth. It is followed by observations of the present writer on the effects of gibberellin on seed germination.

Stimulation of Stem Growth

Cupressus arizonica.[1]—Eight dormant 1-year seedlings were placed under a 16-hour photoperiod and the new stem growth treated with roughly 50 microliters (λ) of 3×10^{-2} molar (M)[2] gibberellic acid (GX). Subsequently the stems were wounded and an unspecified amount of GX (in lanolin) was smeared on. After 70 days the plants were 6 percent smaller than the controls (and locally chlorotic) (reported by T. C. Nelson, *8*).

Juniperus media var. *pfitzeriana* (Beissn.) van Melle (a spreading shrub).—Stems of rooted cuttings were smeared with about 20 mg of 3×10^{-2}M GX (in lanolin + Tween-20). After 70 days the new stem growth exhibited wide variations, but averaged 50 percent increase over controls (reported by Marth *et al.*, *6*).

Picea glauca.—Stems of seedlings were smeared (with or without wounding) with about 20 mg of 7×10^{-3}M to 3×10^{-2}M GX (in lanolin + Tween-20). After 165 days only the initially wounded seedlings increased up to 22 percent over controls (*6*).

Pinus coulteri.—See below.

Pinus lambertiana.—See below.

Pinus taeda. — Seedlings were sprayed with 3×10^{-5}M to 10^{-3}M GX (in tap water + Tween-20 + ethanol). After 60 days new stem growth was up to 40 percent greater than in controls (*6*).

Stems of seedlings were smeared with about 20 mg of 7×10^{-3}M to 3×10^{-2}M GX (in lanolin + Tween-20). After 60 days no effect was observed (*6*).

Roots of seedlings were soaked 4 hours in 3×10^{-6} to 3×10^{-4}M GX (in tap water + Tween-20). Sixty days after planting no effect was observed (*6*).

Pinus strobus.—Treated same as *Cupressus arizonica* above. After 42 days there was no statistically significant effect (*8*).

Stems of seedlings were smeared with about 20 mg of 4×10^{-3}M to 3×10^{-2}M GX (in lanolin + Tween-20). In different lots old or new growth was smeared, with or without wounding. After 90 days no effect was observed in any case (*6*).

Pinus virginiana. — Stems of seedlings were smeared with about 20 mg of 7×10^{-3}M to 3×10^{-2}M GX (in lanolin + Tween-20). In one case seedlings were treated soon after emergence. After 175 days the lower concentration had induced an increase in height over controls of up to 68 percent. In another case, comparable transplants similarly treated showed no effect after 175 days (*6*).

Pseudotsuga macrocarpa. — See below.

Stimulation of Root Growth

Pinus lambertiana.—Excised embryos were grown aseptically under a 12-hour photoperiod at 24°C in contact with a solid nutrient medium. Prior to autoclaving 15 minutes at 110°C this contained 3×10^{-7}M to 3×10^{-5}M GX. The more concenterated GX treatments (48 plants per treatment) resulted in a 45 percent increase in root growth after 14 days, but growth for the subsequent 16 days paralleled growth of the controls. Treated roots exhibited less browning than the untreated roots. There was, however, no difference in comparison with the controls in either cotyledon or hypocotyl growth during the 30 days (*1*).

Pseudotsuga menziesii. — Seeds were germinated at 20°C on filter paper kept moist with up to 3×10^{-4}M GX (in de-ionized water). Over the course of the first week or so, controls (45 plants per treatment) grew about 0.2 mm per hour in the light and about 0.3 mm per hour in the dark. GX treatment apparently had no effect on root growth until the roots attained a length of 5 mm or more. However, over the course of the first week or so roots in either darkness or light and kept moist with 2×10^{-5}M GX grew about 0.4 mm per hour (*10*).

Initiation and Cessation of Vegetative Growth

Pinus coulteri. — Groups of 10 dormant 2-year seedlings were subjected to either 20-hour or 9-hour photoperiods (in most cases at 18-

THE AUTHOR is a graduate student in forestry, Yale University, New Haven, Conn.

[1]Authority for scientific names, where not mentioned, can be found in the check list by Little (*3*).

[2]The several authors' diverse units of measure have all been converted to comparable ones.

30°C). The terminal buds were treated as many as three times a week with up to 4λ of 10^{-2}M GX (in ethanol). The seedlings under a long-day photoperiod initiated vegetative growth within eight weeks. This was, however, no different from the controls, nor was there any difference in subsequent growth. Under short days one or two of the seedlings showed indications of resuming growth after about 17 weeks, again not different from the controls. Later cessation of growth, furthermore, was not prevented by GX treatment (*4*).

Pseudotsuga macrocarpa. — Treated same as *Pinus coulteri* above, with the same negative results (*4*).

Effect on Seed Germination

In one experiment *Pinus banksiana* seeds were soaked for two weeks at either 5° or 25°C. During this time the seeds were immersed in either water or 10^{-4}M GAX (a mixture of gibberellin A and gibberellic acid), both adjusted to pH 7. Subsequently the seeds were incubated on moist filter paper for two weeks at about 25°C. Whereas the cold treatments resulted in a fourfold increase in germination, the gibberellin treatments had a very slightly depressing effect. A similar experiment in which *Pinus strobus* seeds were stratified (moist, aerobic storage at about 5°C) for six weeks yielded the same results.

In order to test the effect of gibberellin following cold treatment, stratified seeds of *Pinus banksiana* and *Pinus resinosa* were permitted to germinate at 25°C on filter paper. The filter paper was kept moist with either water or GAX ranging in concentration from 10^{-8} to 10^{-4}M. Final germination values were erratic, with gibberellin producing no clear-cut effect. The experiment was repeated with the incubation temperature 10°C higher. This resulted in a somewhat better germination of *Pinus banksiana* but a greatly reduced germination of *Pinus resinosa*. Gibberellin did not modify the results in either experiment.

Finally, gibberellin was tested on *Pinus resinosa* seeds stratified for varying lengths of time. Following stratification the seeds were left for 20 days at 17°C on filter paper kept moist with either water or 10^{-7}M GX. Germination was enhanced by increasing the duration of the prior cold treatment, a maximum being reached between 10 and 20 days. Addition of gibberellin had little if any effect. A similar experiment in which the incubation had been carried out at 27°C resulted in highly erratic germinations and inconclusive results.

Discussion

The general conclusion that emerges when one compares gibberellin effects on conifers with those on angiosperms is that gibberellin has a comparatively small effect on the conifers. The question that arises is whether the apparent indifference of conifers to gibberellin is the result of an internal surplus of this compound or of a true indifference to it. In addition to its known occurrence in the fungus *Gibberella fujikuroi*, MacMillian and Suter (*5*) have recently isolated gibberellin from *Phaseolus* L. It may thus, in at least the angiosperms, be an integral component of the plants' hormonal systems.

The most desirable means of attacking the problem would be to determine the amounts of gibberellin in conifers. Investigations of this nature would include the determination of possible differences in "dwarf" and "normal" types, in unstratified and stratified seeds, and so on. With this approach in mind, the author attempted to obtain gibberellin from a conifer in a procedure modified from that of West and Phinney (*12*). Shoots of actively growing 1-year *Pinus radiata* seedlings were homogenized in 50 percent (v/v) acetone. This *brei* was filtered and reduced to dryness at 50°C and the residue taken up in water buffered at pH 3. The aqueous solution was shaken with ethyl acetate and the latter fraction reduced to dryness. The resulting residue was taken up in pure ethanol. Tests for gibberellin-like activity were based on those of P.W. Brian and H. G. Hemming [Physiol. Plant., Copenhagen 8:669-681] and Phinney *et al.* (*9*). A quantity of extract representing about one gram fresh weight of original tissue produced no growth effect on the internodes of the dwarf *Pisum sativum* L. var. "Progress #9" nor on the leaf sheaths of *Zea mays* L. var. "Dwarf-1." It, furthermore, could not alter the marked growth promotive response to simultaneous application of 0.1 microgram GX. The results were, therefore, totally negative and lend support to the theory that conifers are normally independent of gibberellin.

An additional profitable approach to the problem would be to determine the effects of gibberellin on such inherently small conifers as *Cupressus macnabiana*, *Pinus aristata*, *Juniperus monosperma*, or *Taxus canadensis* Marsh. Occasionally dwarf varieties of normally large trees are available. A recently described example is of *Pinus strobus* (*2*). Another possible experimental subject on which apparently nothing has been published is *Pinus palustris* during its early dwarf ("grass") stage.

Another possible experimental approach might be to test the effect of gibberellin on artificially dwarfed conifers. This could be accomplished, for example, by prior treatment with the substituted quaternary ammonium compounds described by Marth *et al.* (*7*) which produce effects at least superficially opposite to those of gibberellin in some plants.

Note Added in Proof

Recently P. F. Bourdeau (Nature, Lond. 182:118) reported that gibberellin promoted the growth of *Pinus elliottii* which was being retarded by an unfavorably short photoperiod. G. R. McVey and S. H. Wittwer (Quart. Bull. Mich. Agric. Expt. Sta. 40:679-697) reported, furthermore, that gibberellin slightly promoted the growth of the "dwarf" *Thuja occidentalis f. hoveyi* (Hoopes) Beissn., but retarded that of *Taxus cuspidata* Sieb. & Zucc.

Literature Cited

1. BROWN, C. L. and E. M. GIFFORD, JR. 1958. Relation of the cotyledons to root development of pine embryos grown in vitro. Plant Physiol. 33: 57-64.
2. CHISMAN, H. H. and N. LYLO. 1958. Dwarf form of eastern white pine (Pinus strobus L.) Jour. Forestry 56:110-112.
3. LITTLE, E. L., JR. 1953. Check list of native and naturalized trees of the United States (including Alaska). U.S. Dept. Agri. Handbook 41, 472 pp.
4. LOCKHART, J. A. and J. BONNER. 1957. Effects of gibberellic acid on the photoperiod-controlled growth of woody plants. Plant Physiol. 32: 492-494.
5. MACMILLAN, J. and P. J. SUTER. 1958. Occurrence of gibberellin A_1 in higher plants: isolation from the seed of runner bean (Phaseolus multiflorus). Naturwissenschaften 45:46.
6. MARTH, P. C., W. V. AUDIA, and J. W. MITCHELL. 1956-1957. Effects of gibberellic acid on growth and development of plants of various genera and species. Bot. Gaz. 118:106-111.
7. MARTH, P. C., W. H. PRESTON, JR. and J. W. MITCHELL 1953-1954. Growth-controlling effects of some quaternary ammonium compounds on various species of plants. Bot. Gaz. 115:200-204.
8. NELSON, T. C. 1957. Early responses of some southern tree species to gibberellic acid. Jour. Forestry 55: 518-520.
9. PHINNEY, B. O., C. A. WEST, M. RITZEL, and P. M. NEELEY. 1957. Evidence for "gibberellin-like" substances from flowering plants. Proc. Nat. Acad. Sci. U.S. 43:398-403.
10. RICHARDSON, S. D. 1958. Radicle elongation of *Psuedotsuga menziesii* in relation to light and gibberellic acid. Nature, Lond. 181:429-430.
11. STOWE, B. B. and T. YAMAKI. 1957. History and physiological action of the gibberellins. Annual Review of Plant Physiology 8:181-216.
12. WEST, C. A. and B. O. PHINNEY. 1957. Purification and properties of gibberellin-like substances from flowering plants. Plant Physiol. 32:xxxii.

Organizing Committee for World Forestry Conference Announced

The Department of State has announced that Richard E. McArdle, chief of the U. S. Forest Service, has been named chairman of the Organizing Committee for the Fifth World Forestry Congress which will be held at Seattle, Washington, in 1960. The site of this international meeting, the first for which the United States Government will be the host, is the campus of the University of Washington. Officially opening on August 29, 1960, this Congress will run until September 10. Official participation in this international congress will be upon invitation of the United States Government.

Henry Schmitz, president emeritus, University of Washington, has been named honorary vice chairman. William M. Gibson, deputy director, Office of International Conferences, Department of State, will serve as vice chairman.

I. T. Haig, assistant to the chief of the U. S. Forest Service, has been designated executive secretary, and Harold A. Vogel, regional representative, Food and Agriculture Organization of the United Nations, has been named honorary member.

Members of the Committee include persons active in forest conservation and the forest industries. Those designated members of the Organizing Committee are:

George B. Amidon, Minnesota and Ontario Paper Co., International Falls, Minn.

Kenneth E. Barraclough, University of New Hampshire, Durham, N. H.

Roy Battles, The National Grange, Washington, D. C.

Paul W. Bedard, Office of Food and Agriculture, International Cooperation Administration.

Willard S. Bromley, American Pulpwood Association, New York.

Charles C. Butler, American Farm Bureau Federation, Washington, D. C.

Charles H. Callison, Natural Resources Council of America, Washington, D. C.

Whitford B. Carter, Los Angeles Watershed Commission, Los Angeles, Calif.

Fred H. Claridge, Association of State Foresters, Raleigh, N. C.

Henry Clepper, Society of American Foresters, Washington, D. C.

Kenneth Davis, United Brotherhood of Carpenters, Portland, Ore.

Dwight B. Demeritt, Dead River Company, Bangor, Maine.

Mortimer B. Doyle, National Lumber Manufacturers Association, Washington, D. C.

Ursula Duffus, Office of International Economic and Social Affairs, Department of State.

Paul M. Dunn, St. Regis Paper Company, New York.

W. Jeter Eason, Forest Products Research Society, Memphis, Tenn.

Alfred E. Fivaz, Forest Products Division, Department of Commerce.

Edelen Fogarty, Office of International Resources, Department of State.

Tom Gill, Charles Lathrop Pack Forestry Foundation, Washington, D. C.

V. L. Harper, Forest Service, U. S. Department of Agriculture.

Albert F. Hartung, International Woodworkers of America, Portland, Ore.

Edwin F. Heacox, Weyerhaeuser Timber Company, Tacoma, Wash.

James H. Kitchens, Jr., Council of Forestry Association Executives, Alexandria, La.

Walter M. Leuthold, Deer Park Pine Industries, Inc., Deer Park, Wash.

Joseph E. McCaffrey, International Paper Company, Mobile, Ala.

Gordon D. Marckworth, College of Forestry, University of Washington, Seattle.

David Mason, Mason, Bruce and Girard, Portland, Ore.

Robert E. O'Connor, American Paper and Pulp Assn., New York.

Kenneth B. Pomeroy, American Forestry Association, Washington, D. C.

Harry V. Ryder, Jr., Office of International Conferences, Department of State.

O. Harry Schrader, Jr., United States Plywood Corporation, Seattle, Wash.

John F. Shanklin, Office of the Secretary, Department of the Interior.

Hardy L. Shirley, College of Forestry, State University of New York, Syracuse, N. Y.

Richard W. Smith, Natural Resources Department, Chamber of Commerce of the United States, Washington, D. C.

Edward P. Stamm, Crown Zellerbach Corporation, Portland, Ore.

John B. Veach, American Forest Products Industries, Asheville, N. C.

Corydon Wagner, St. Paul and Tacoma Lumber Company, Tacoma, Wash.

Lloyd T. Webster, Department of Natural Resources, Olympia, Wash.

Charles L. Wheeler, Pope and Talbot, Inc., San Francisco, Calif.

Having as its theme the multiple-use aspects of forestry, the program of this Fifth Congress will emphasize the worldwide dependence of all nations and all peoples on forests and their related resources, including water, wildlife, and grass. Individual technical sessions will be scheduled on such subjects as silviculture, forest genetics, forest economics, forest products utilization, forest protection (from fire, insects, and disease), forest education, and the management of forest ranges and watersheds.

Papers to be presented at the Congress will be of two types: 1) those prepared by world authorities upon the invitation of the Program Committee and 2) papers submitted voluntarily by participants.

Preceding the technical sessions at Seattle, there will be a number of optional field tours for foreign foresters who may wish to visit places of special forestry interest in the United States and Canada. The excursions will be so planned as to enable visitors to observe a wide variety of forestry activities.

Inquiries concerning the Congress should be addressed to:

Dr. I. T. Haig, Executive Secretary,
Organizing Committee, Fifth World Forestry Congress,
Care: Office of International Conferences,
Department of State,
Washington 25, D. C.
United States of America.

Notes and Observations

Planting Following Prescribed Fire[1]

THE INVASION of undesirable hardwoods in the lower Piedmont province of Georgia poses an ever-increasing problem to foresters. Removal of the pine overwood favors the expansion of hardwoods on one of every two acres cutover.

Possibly, the exclusion of wildfire is a contributing factor in eliminating the pine component on upland hardwood sites. Until the past decade, wildfires were promiscuously set for a number of reasons—of which hardwood control was not one. These wildfires destroyed many pine seedling stands. But repeated fires also relegated understory hardwoods temporarily to a minor position where pine could become established on hardwood sites.

For some years foresters have been prescribing fire for hardwood control in the Coastal Plain of the Southeast. In the flatwoods of South Carolina, consecutive summer fires, for three and four years, killed many root stocks. Size and vigor of sprouts from surviving roots were also reduced and 50 percent of the small hardwood stems were eliminated.[2]

In the rolling Piedmont, however, those concerned with soil and watershed protection, as well as with forest management, hesitate to prescribe more than a single burn to a site. Here the original surface soil has been almost entirely lost to erosion; and the red clay of the virgin B horizon is at the surface. Low in organic matter, these surface soils have little stable structure although the ecological succession of broom-sedge and hardwoods has helped somewhat. Duff-mull humus layers develop where mixed pine-hardwood cover exists. Continuously burning such sites cannot be recommended.

A single burn was found to be especially useful on the Hitchiti Experimental Forest in the lower Piedmont where pine regeneration was needed, but where understory hardwoods precluded its establishment. The area was hand-planted with one-year-old loblolly pine stock the week following the burn in order to give the seedlings every possible advantage over subsequent hardwood sprouts (Figs. 1 and 2).

Description of prescribed burns.—Burning was begun late in the morning on three days early in March 1955. Wind was about three miles per hour from the north and northwest. All fires were set to burn down the slopes which ranged in aspect from NNE to ENE. Degree of slope approximated nine percent. Stick moisture ranged from 2 to 7 percent at ignition time, while relative humidity varied from 20 to 42 percent. The temperature was above 60°F, and the burning index was about 30 on a SCW woods station meter. Rate of fire movement averaged about 3 miles per hour.

Vegetation surveys.—Permanent widthless transects were established prior to burning. Vegetation overtopping the taut line of these randomly spaced transects was charted. Milacre stocking for pine was tallied in contiguous square milacre plots running the length of the transects on each side. Before burning, there was an average of 48 natural pine seedlings per acre free to grow and 17 per acre overtopped. Sixty-nine percent of the

[1]Financial assistance for the study was provided by the Georgia Forest Research Council and the Georgia Forestry Commission. Journal Series Paper No. 55, College Experiment Station, University of Georgia, Athens.

[2]Chaiken, L. E. Annual summer fires kill hardwood root stocks. Southeastern For. Expt. Sta. Res. Note No. 19. 1952.

FIG. 1.—Prescribed fire was effectively used to control this brush.

FIG. 2.—Following the fire, loblolly pines were planted. These have been outplanted for four growing seasons.

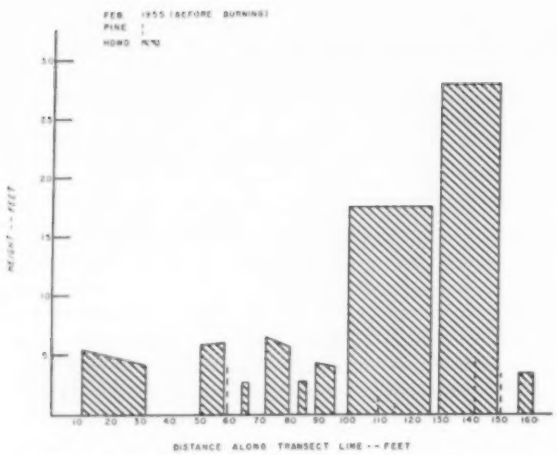


FIG. 3.—Height and breadth of non-herbaceous vegetation on a typical transect line before burning.

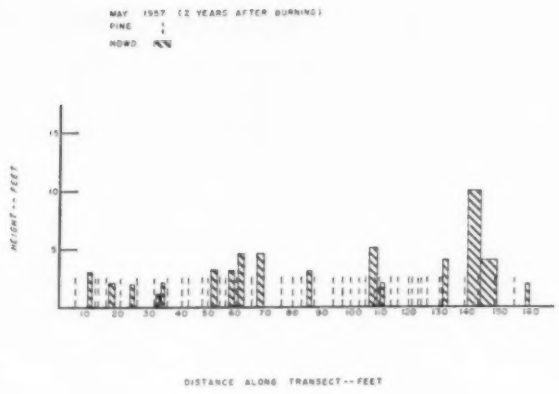


FIG. 4.—Height and breadth of non-herbaceous vegetation on the same transect line as for Figure 3 two years after burning.

TABLE 1.—MILACRE PINE STOCKING IN PERCENT BEFORE AND AFTER BURNING

Fire no.	Before burning		After burning					
	Natural pines		Natural pines		Planted pines		All pines	
	Free	Overtopped	Free	Overtopped	Free	Overtopped	Free	Overtopped
1	4	1	12	1	62	—	74	1
2	9	2	4	1	73	—	77	1
3	1	2	5	0	80	—	85	0
Average	5	2	7	1	73	—	80	1
Check	5	0	9	11	—	—	9	11

TABLE 2.—PERCENT OF TRANSECT LINE COVERED BY HARDWOODS BEFORE AND AFTER BURNING

Fire no.	Before burn	After burn
1	65	19
2	78	24
3	64	16
Average	69	20
Check	97	98

transect lines were overtopped with hardwoods (Fig. 3).

Two years after the burn, the lines were again surveyed. At this time there was 7 percent milacre stocking of natural pines free to grow and 73 percent of planted pines, providing a total milacre stocking of 80 percent free-growing seedlings. Only 20 percent of the transect lines were overtopped by deciduous species (Tables 1 and 2, Fig. 4).

These results, while yet exploratory, serve to confirm those obtained earlier for seedlings now four years old—that planting immediately after the application of a winter prescribed burn is an effective way to convert brush to good pine stocking (Table 3).

TABLE 3.—STOCKING AND HEIGHT OF LOBLOLLY PINE FOUR YEARS AFTER BURNING AND PLANTING

Treatment	Stocking		Average height	
	All trees	Free growing	All trees	Free growing
	Percent		*Feet*	
Planted in open	78	78	7.1	7.1
Burned and planted	74	43	5.2	5.9
Not burned, planted in moderate dense cover	67	28	4.2	5.1
Not burned, planted in dense hardwood cover	70	0	3.0	0

LAURENCE C. WALKER
and ERNST V. BRENDER
School of Forestry, University of Georgia, and Southeastern Forest Experiment Station, respectively

Georgia's Seed Certification Program

February 8, 1958, marked the final acceptance of Certification Standards for Forest Tree Seed by the Georgia Crop Improvement Association. This action climaxed more than two years of work by a committee of the Georgia Chapter of the Society of American Foresters.[1] These Standards provide the means for the introduction and control of high genetic quality tree seed in the Georgia market.

In 1956 the Georgia Legislature passed two bills which encouraged the establishment of Certification Standards. One bill (H.B. 195) provided for the licensing of seed dealers and the labeling of seed. H.B. 104 established the College of Agriculture of the University of Georgia as the legal certifying agency, with the Georgia Crop Improvement Association as its agent to administer the program. The Crop Improvement Association is a non-profit corporation, supported and controlled by its members. Most states have similar associations which deal with agricultural seed.

In its usage here, "Certification" means more than just labeling seed as to geographic source, germination, and purity. Certification means that these seed are produced in accordance with certain specifications to insure high genetic quality. The Federal Seed Act (August 9, 1939-53 Stat. 1275) defines Certified Seed as "seed that has been produced and labeled in accordance with the procedures and in compliance with the rules and regulations of an officially recognized seed-certifying agency."

Contrary to Baldwin's opinion (*1*) that, "We are forced to conclude that certification . . . may be meaningless so far as vigor and form of the progeny are concerned," foresters in Georgia are looking forward to the availability of seed of higher genetic quality which will provide better stands of timber for the future. The basis for production of improved strains is given in numerous reports in the literature describing variations and inheritance of several important traits in southern pines (*2, 3, 4, 5, 6, 7*).

The Georgia Standards provide for 3 classes of Certification. Production from seed-producing areas[2] and from individually selected plus trees will qualify for Class III. Seed from seed orchards and from elite trees will qualify for Class I or Class II, depending upon completion of progeny tests and adequacy of isolation strips.

To develop a seed-producing area, the initial requirement is a good stand of the species desired. Only trees above average in vigor and form, below average in branch size, and free from pests shall be permitted to remain in the stand. An isolation strip 400 feet wide is required. This strip may contain other species which will not cross-pollinate and it may contain trees of the same species, provided that they meet the same standards as the production area.

Seed orchards must contain at least 15 clones arranged in a manner to permit cross-pollination. The records of the ortets must be available for inspection. The isolation strip shall be 400 feet. Prior to the completion of progeny tests the seed will be eligible for Class II Certification. After acceptance of the progeny tests by the Association the seed can be Certified Class I.

Seed from elite trees with a minimum isolation strip of 100 feet will be Certified Class II. If the seed are from controlled pollinations and the cross has been progeny-tested, they will qualify as Class I.

Each landowner must have his trees or stands inspected at least 21 months prior to seed collection to insure a minimum of pollen contamination. There will be another inspection immediately prior to seed collection and at this time the inspector, a specially trained forester, will provide the Association with an estimate of production. This estimate will aid the Association in detecting violations. The producer is subject to inspection at any time during collection, processing, and storage of seed. As in all programs of this type, there will be great dependence upon the integrity of the individual producer.

The Crop Improvement Association is organized into 6 commodity groups, one of which is forestry. Each group has a Crop Improvement Committee which considers any changes in the standards and the addition or deletion of species or cultivars from the eligible list. Their annual meeting is open to the public and anyone can enter the discussions. The Committee recommendations are then transmitted to the Board of Directors for final action. A Certification Committee rules on disputes between producers and the Association, and an Advisory Committee aids in guiding the long-range objectives of the Association. Representatives of forestry interests sit on these committees and on the Board of Directors.

Inspection fees are set to cover the cost of the inspection and are kept as low as possible. Basic membership and farm fee total $9.35 and an acreage fee is assessed at the rate of $2.00 per acre for the first 25 acres in one county and $1.00 per acre above 25. Fees must be paid at the time of application for inspection.

At present only the four major species of southern pines are eligible for certification; other species will be added as the need arises. Minimum specifications for seed quality and storage after testing are also included.

The goal of this program is to have all seed and seedlings planted from material of highest genetic quality. As Class I seed become

[1]Members who have served on this committee are Sanford P. Darby, Everett S. Lyle, Ernest Hinson, Keith W. Dorman, Thomas F. Swofford, Walter Stone, John C. Barber, L. W. R. Jackson, and Archie E. Patterson.

[2]See *Forest Terminology*, 1958 edition, for definition of terms.

available, Class III and, finally, Class II seed will be dropped from the Standards. The final exclusion of Class III and Class II seed will require a waiting period of several years, pending the completion of progeny tests. New techniques in progeny testing are expected to speed up the completion of tests, especially in the field of wood quality, and these developments will make possible the large-scale production of Class I seed in the not-too distant future.

Copies of the Standards and further information about Georgia's program can be obtained from The Georgia Crop Improvement Association, Hoke Smith Annex, University of Georgia, Athens, Georgia.

Literature Cited

1. BALDWIN, HENRY I. 1954. Seed certification and forest genetics. Jour. Forestry 52:654,655.
2. BARBER, JOHN C., KEITH W. DORMAN, and EITEL BAUER. 1957. Slash pine progeny tests indicate genetic variation in resistance to rust. South. Conf. Forest Tree Impr. Proc. 4:44-46.
3. ECHOLS, R. M. 1955. Linear relation of fibrillar angle to tracheid length, and genetic control of tracheid length in slash pine. Tropical Woods 102: 11-22.
4. MERGEN, F. 1955. Inheritance of deformities in slash pine (*Pinus elliottii*). South. Lumberman 190(2370): 30-32.
5. ———, P. E. HOEKSTRA, and R. M. ECHOLS. 1955. Genetic control of oleoresin yield and viscosity in slash pine. Forest Sci. 1(1):19-30.
6. ZAK, B. 1957. Resistance to littleleaf in shortleaf pine. South. Conf. Forest Tree Impr. Proc. 4:41-43.
7. ZOBEL, BRUCE. 1957. Inheritance of wood properties in pine. South. Conf. Forest Tree Impr. Proc. 4:27-29.

JOHN C. BARBER
Southeastern Forest Experiment Station, Forest Service, U. S. Department of Agriculture
and SANFORD P. DARBY
Georgia Forestry Commission

Distinguishing Annual Rings in Diffuse Porous Tree Species

Foresters making growth studies in diffuse porous species such as black gum (*Nyssa sylvatica*, Marsh.), tupelo gum (*Nyssa aquatica*, L.), red gum (*Liquidambar styraciflua*, L.), yellow-poplar (*Liriodendron tulipifera*, L.), and others, have been faced with the almost impossible task of counting or measuring annual rings which can not be clearly distinguished in these species. One procedure for making the growth rings more distinct involves the use of a phloroglucinol solution which stains the lignin of the wood a red color, leaves the cellulose unstained, and makes the growth rings much more evident. At the risk of repeating a standard, or well known, procedure it may be of value to the field forester to outline the steps involved in this method.

Two solutions are needed: a one percent solution of phloroglucinol in 95 percent ethyl alcohol; and a 50 percent solution of hydrochloric acid. The phloroglucinol solution is made by dissolving one gram of phloroglucinol crystals in 100 cc. of 95 percent ethyl alcohol. The phloroglucinol crystals can be obtained from any chemical supply house at a cost of approximately $2.50 per 25 gram bottle.

The procedure is to soak the increment cores in the phloroglucinol solution for approximately one minute; then place them in the hydrochloric acid solution for one minute. Finally, remove the cores from the acid solution and wash in water when they begin to turn red. The growth rings will become more evident as the cores dry, and if they are *examined in the light from a fluorescent lamp* no difficulty in distinguishing annual rings will be encountered.

Since two solutions are used in the process, one of which is an acid, and since the increment cores can be treated in either a wet or dry condition, the field man may wish to collect the cores during the day and treat them and count the rings at some other time. In such case they can be placed in large-size soda straws and properly labeled for future examination. This, of course, also allows for examination under the fluorescent light which has been found to be a major factor in distinguishing the rings by this method.

ARCHIE E. PATTERSON
School of Forestry, University of Georgia, Athens

Multi-Seeded Acorns

Based upon observations, both of nursery grown seedlings and seedlings on sample plots in natural timber stands, multi-seeded acorns are not uncommon. Four of the five species of red oaks observed exhibited approximately 1 to 2 percent multi-seeded acorns. The species observed were: cherrybark red oak (*Quercus falcata* var. *pagodaefolia* Ell.), Shumard oak (*Q. shumardii* var. *shumardii* Buckl.), northern red oak (*Q. rubra* L.), black oak (*Q. velutina* Lam.), and pin oak (*Q. palustris* Muenchh.). Pin oak was the only species of the five observed that failed to exhibit multi-seeded acorns.

Just under 2 percent of approximately 435 germinating acorns of red and black oak in nursery beds and field plots contained more than one seed and approximately 1 percent of slightly more than 1,000 germinating Shumard and cherrybark acorns contained more than one seed. The nursery grown acorns were collected from different trees and in some cases from more than one locality. The observations in the field on black and red oak were made on 30 one-fifth acre plots in different parts of southern Illinois.

Figure 1 shows examples of seedlings developed from multi-seeded acorns. However, as Figure 2 shows, not all acorns producing more than one shoot are multi-seeded. Several stems often develop from one-seeded acorns containing but two cotyledons.

According to Buchholz[1] each female flower in oaks contains six ovules, but usually only one enlarges and matures to form a seed.

FIG. 1.—Seedlings from multi-seeded red oak acorns. Note the separate root systems.

The other five ovules abort. In reporting multiple seeds in a single *Q. falcata* tree at Conway, Arkansas, he pointed out that there is no regularity in radial orientation of the cotyledons or embryos, nor are they equally developed. Often small embryos are crowded toward the apex.

FIG. 2.—Multiple stemmed seedlings produced from a single seeded acorn. Note the single root system.

Other authors have mentioned multi-seeded acorns. Coker[2] reported multi-seeded acorns from *Q. prinus* (Michauxii) and *Q. alba* and also an individual acorn of *Q. velutina*. Harvey[3] reported one case of *Q. alba* which he described as an example of polyembryony. In each of the above instances, however, the reports were concerned with individual acorns or acorns from individual trees, and the impression was given that multi-seeded acorns are rare. Buchholz[4] even suggested that the tree observed might be a sub-variety or a mutation. However, based upon the above observations, a small percentage of multi-seeded acorns from most lots of seeds are not uncommon.

JOHN F. HOSNER
Associate professor of forestry, Southern Illinois University, Carbondale

[1]Buchholz, J. T. 1941. Multi-seeded acorns. Trans. of Ill. Academy of Science. 34:99-101.

[2]Coker, W. C. 1904. Multi-seeded acorns. Bot. Gaz. 37:61-62.

[3]Harvey, Leroy H. 1917. Polyembryony in *Quercus*. Mich. Acad. of Sci. Rept. 19:329-331.

[4]Op. cit.

Drainage of Swamp Lands for Forestry Purposes in Finland

Finland receives about 80 percent of her export revenues from forest products. Consequently, considerable effort is being made to increase wood production through intensive research and amelioration of site conditions. This is particularly true of swamp forests whose 20,000,000 acres comprise over 30 percent of the total area of the republic.

Research pertinent to swamp lands embraces the study of microclimatic conditions, hydrological aspects, content of soil nutrients, and the behavior of different tree species. The studies thus far completed indicate that artificial drainage can convert many peat deposits into productive lands. In a large measure, the solution of the problem of drainage is facilitated by the fact that there is a close correlation between the productive potential of peat soils and the composition of their forest cover, including trees and ground cover vegetation.

In a broad classification for forestry purposes, the swamp lands are first divided into three groups: pine swamps, spruce-birch swamps, and treeless swamps. The nutrient content of peat deposits is further estimated on the basis of the predominant ground cover vegetation. Most fertile peat soils support abundant eutrophic mosses. If these are not found, but herbs are present in moderate abundance, the swamp is poorer in nutrients. If neither is present, but high sedges plentiful, the site is regarded as moderately rich in nutrients. The abundance of *Eriophorum vaginatum*, *Scirpus caespitosus*, *Ledum groenlandicum*, *Vaccinium uliginosum*, and *Calluna vulgaris* identifies peat soils of low nutrient content. The predominance of *Sphagnum fuscum* manifests the extreme impoverishment of organic deposits and ground water in nutrient elements.

Peat soils with a cover of eutrophic mosses, sages, and herbaceous plants can be transformed by drainage into highly productive forest lands, fully comparable in their site quality to fertile upland soils. The drainage of other swamps is ineffective without application of fertilizers for such swamps are critically deficient in available nutrients. As experience has shown, the deficiency of phosphorus can usually be corrected by application of about 500 pounds per acre of 27 percent phosphate fertilizer, whereas the deficiency of nitrogen by application of 300 pounds per acre of 25 percent saltpetre. Because the nutrient elements are returned with the annual leaf fall, the application of fertilizers does not need to be repeated for at least twenty years.

Thus far nearly 2,500,000 acres of swamps have been drained for the purpose of improving forest growth. This task was accomplished by digging about a hundred thousand miles of ditches. As a rule, the ditches are about 2½ feet deep. Depending on the gradient, the distance between the ditches varies from 160 to 270 feet. In more productive swamps underlain by swiftly moving ground water, the distance between the ditches is greater than in swamps with a sluggish subterranean runoff.

In the initial stages, the work was accomplished by hand labor. In the postwar days this was largely replaced by dynamiting. Because swamp forests of Finland are often supported by stony and shallow peat soils with many stumps, the common plows were found impractical. Therefore, in 1951 attempts were made to construct a more suitable plow. In 1954 the design of the plow was perfected and it is now being manufactured by Lokomo Company at Tampere, Finland. This plow weighs 8,500 pounds and is constructed to withstand the utmost rigors of work (Fig. 1).

The efficieney of the new plow was in part responsible for a great increase in the extent of drainage. The total length of drainage ditches excavated in 1951 was a mere 5 miles; in 1956, the excavated distance attained 5,000 miles. At the same time, the use of the plow has drastically reduced the cost of drainage and provided good ditches (Fig. 2A).

The plowing is done by the use of 10- to 20-ton tractors with especially broad tracks. The Allis-Chalmer's tractors and Caterpillars proved to be most suitable for

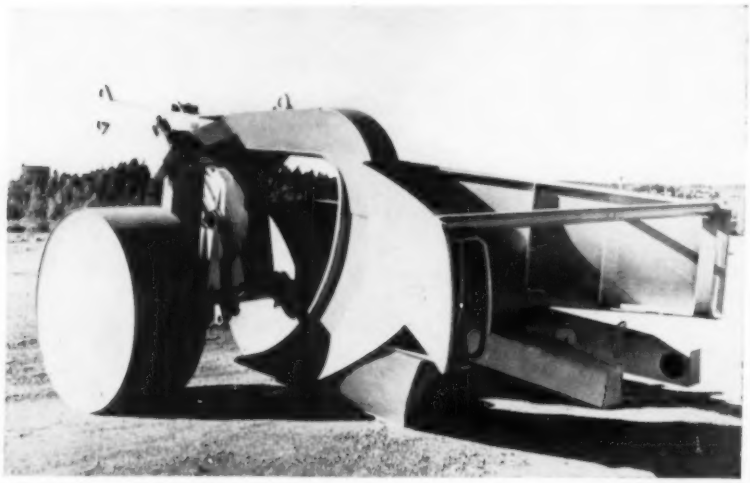


FIG. 1.—Four ton plow for excavation of drainage ditches in forested swamps. (*Lokomo Company, Tampere, Finland.*)

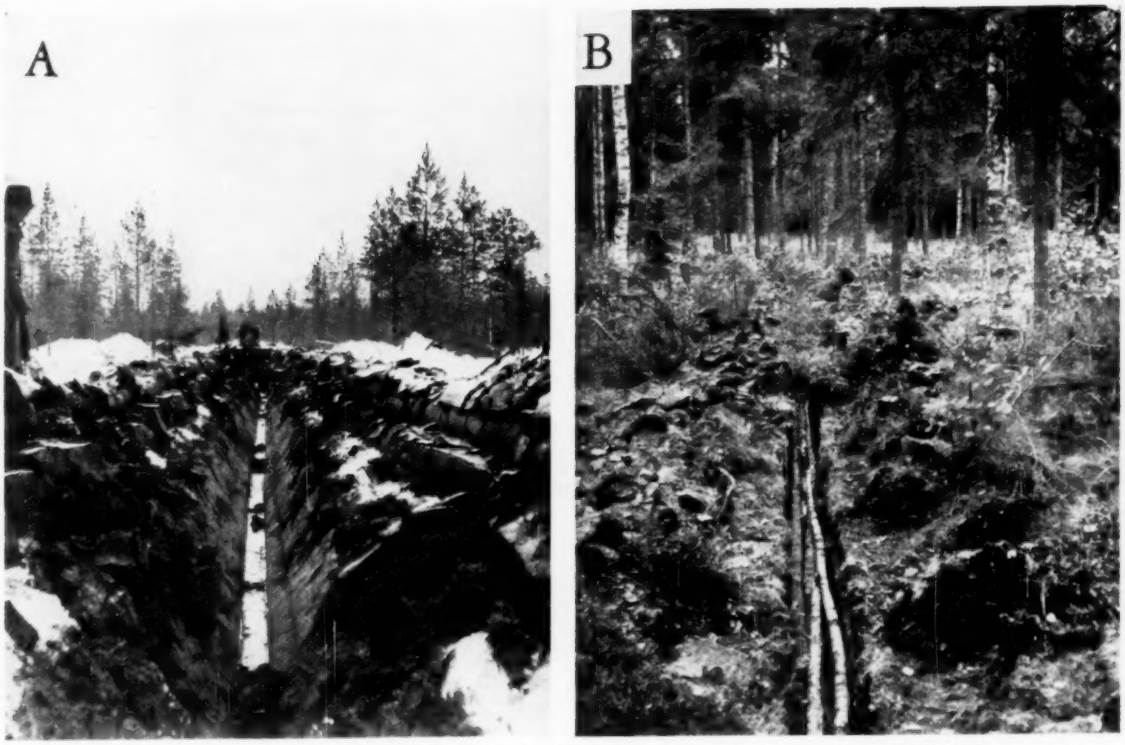


FIG. 2.—Construction of open (A) and closed (B)drainage ditches in forest swamps of Finland.

the purpose. The plowing is usually accomplished by means of a winch and a steel rope rather than by the direct draft. This method is particularly effective on areas with a thick layer of peat. When working on peat deeper than 1.7 feet, it is often necessary to reinforce the surface of the deposit with logs. In the event the tractor sinks into the swamp, it is pulled out with the aid of the winch while the plow serves as an anchor. Occasionally it is necessary to place large poles under the tracks.

The finishing of the excavated ditches, facilitating the free flow of water, is accomplished by a spade. The rate of dredging in the entire country in 1956 varied from 500 to 2,500 feet per hour.

In recent years, the forest drainage operations take advantage of the available wood material and supplement the network of open ditches with covered ditches. The covered ditches are dug first as open ditches with vertical sides. They are about 2½ feet deep and 1 foot wide. At the bottom of these ditches are placed branches and poles which are covered by raw Sphagnum moss or sod, and finally with the excavated soil (Fig. 2B). A special plow is now being constructed which would dredge the channel in one operation. Experience has shown that covered ditches are capable of functioning at least 40 years in peat soils and 25 years in mineral soils.

The National Forest Survey of Finland has indicated that there are ten million acres of swamps suitable for profitable amelioration. The new methods of drainage offer definite promise that this enormous area will be gradually converted into land supporting productive forest stands, an achievement of great importance for a country of small population and limited capital.

If the peat deposit has sufficient fertility and is skillfully drained, it usually doesn't require artificial reforestation, for swamp forests of Finland possess a high capacity for natural regeneration.

The artificial regulation of the ground water level and the use of fertilizers may raise the total annual increment of Finnish forests by about 17 million cubic meters or roughly four million cords.

OLAVI HUIKARI
Forest Research Institute of Finland, Helsinki

Book Reviews

Land: The Yearbook of Agriculture

605 pp. Illus. U. S. Department of Agriculture, Washington 25, D. C. 1958. $2.25.

Although its essays and articles are all centered on our land resources, the multiplicity of approaches used make it impossible to classify the 1958 Yearbook of Agriculture in one field or another. Our land resources are discussed as seen by the philosopher and historian, the forester and the agricultural scientist, the economist, and the sociologist. We learn of our management of the land resource, problems of the present and take a look into the future.

The purpose of the book ". . . is to spur us to forward-looking action" to meet problems of land use. The general layout follows that of previous "Yearbooks"; a number of sections deal with broad subject-matter areas, and subsections by individual authors deal with specific topics within the area.

The book begins with a panoramic view of our land resources; the history of the public domain, its acquisition and disposition; and the uses to which we have put land.

A more detailed section follows on the use of public lands under the administration of the Department of the Interior, the Defense Department, and the states.

Following a discussion of the manifold uses of agricultural land for crop and livestock production, two succeeding sections deal with the financial aspects of land use and with land ownership.

Current approaches to land-use problems are the subject of another section. Extension services, technical advice, watershed projects, zoning and group action programs are among the devices discussed for taking care of land resources.

The forest-land resource is treated in a separate section which contains papers on forestry on private lands and on the national forests. The programs for cooperation with and advice and assistance to private forest landowners—the result of the policy decision in the 1920's to depend on cooperation and education rather than regulation to attain timber production goals—are covered. The forestry section concludes with an estimate, based on *Timber Resources for America's Future*, of potential demand for timber.

The land resources of Hawaii, Puerto Rico, and our 49th state, Alaska, are covered in a separate section and should be of much current interest.

Two concluding sections are concerned with current needs and problems and plans for the future.

Worth mentioning are the two groups of black and white pictures in the book—one a series showing a picture history, if you will, of the land, complete with captions such as one might expect to find in the pages of *Life;* the other showing "the face of our land as it looks to the sky," an extremely interesting set of aerial photos taken in different parts of the country.

The book suffers somewhat from the placing of an essay or article under one section heading rather than another. This reviewer, at any rate, boggled at the inclusion under the forestry section of a piece on land clearing. Another example that should not go unmentioned is the placing of a series of charts and maps—of such diverse items as "uses of cropland harvested" and "distribution of forest land," to mention only two—under the major section dealing with the financial aspects of land use.

Of necessity the treatment that can be given to the great number of subjects in 605 pages limits the depth to which analysis can be carried. Nevertheless, the broad outlines of the picture of our land resources have been painted very well. This is an extremely interesting book and one which the forester-as-citizen can find profit in reading.

E. T. Sullivan
University of Minnesota

Forestry in Sweden

By Thorsten Streyffert. 55 pp. Illus. School of Forestry, Oregon State College, Corvallis, Ore. 1958. (No charge.)

Professor Streyffert is dean of Sweden's Royal School of Forestry. He is an internationally distinguished forest economist who has studied in many countries, and has authored many important publications. *Forestry in Sweden* is a compilation of his lectures while visiting professor at the School of Forestry, Oregon State College. Publication was made possible through the aid of the Lewis W. and Maud Hill Family Foundation.

The subject matter is presented with sure attention to historical development, and to natural and social environment combined with a measure of philosophy that mark the expert authority. Its scope may be indicated by noting the eight sections of the text:

"Forest Regions." Sweden is a northern country extending 1,000 miles from about 55° to 69° latitude. The great influence of the Gulf Stream enables commercial forests—mainly Norway spruce and Scotch pine interspersed with birch and aspen—to grow throughout its length. The forest variations due to differences in latitude, elevation, soil, and climatic factors are described.

"Introduction to Swedish Forestry" describes the economic setting, with many comparisons with Oregon conditions. In Sweden the

timber is much smaller, the growth rate only one-third Oregon's, roads cost far less, industrial units are smaller, large forest industries are integrated, utilization is closer, and stumpage values higher.

"Forest Policy in Sweden" traces the evolution of the basic policy of sustained yield from its inception 300 years ago to safeguard the supply of charcoal wood for the predominant iron industry. Public regulation first pertained to cutting and sawmilling, was relaxed during the Era of Liberalism, and was reactivated for forest practices and implemented in 1905 through the county forestry boards. Important adjuncts are public aids and general public education. The last is the main field for further development of public action.

"Forest Research in Sweden." Stimulated by the handicap of slow growth, and the conception of forestry as an economic undertaking, Sweden pursues a vigorous, broad program of forest research by, and under the leadership of, the Forest Research Institute, which corresponds to the Branch of Research in the United States Forest Service. Especially interesting to this reviewer is the work in genetics to develop superior strains from "elite" trees which has reached the seed orchard stage.

"Kramfors Company: a Case Study" traces the evolution of this great company from a tiny sawmill in 1744 to a great integrated company owning 935,000 acres of forest land, which became a subsidiary of Swedish Cellulosa Company in 1930 and was completely merged with it in 1956. The relation of forest industry companies to forestry and to the maintenance of permanent communities is explained.

"The Farm Forest Problem." Farm forests are the most difficult category. The public county forestry boards and the private forest owner cooperative associations through which the inherent difficulties of small ownerships have largely been overcome, are described. The advantages and disadvantages of combining farming and forestry are discussed.

"World Timber Trends" diverges from Swedish forestry to consider the world's future needs for timber, and the prospects for supplying them. The author draws upon his bulletin "Världens framtida virkesförsörjning" (World Timber Trends and Prospects) published in Sweden in 1957, and soon to be published in English.

"Does Forestry Pay?" takes up the underlying considerations that motivate major categories of owners. The industrial owner wants to assure a permanent supply of raw material for his profitable industry. The public owner is concerned with financial returns and social benefits for the long term. The farmer takes a shorter perspective into the future. The availability of investment funds, and other influencing factors, are discussed. There is, also, the over-riding importance of forestry in Sweden's national economy.

Appendixes contain pertinent statistical information, and the Swedish Forestry Law which is the legal basis of the program for private forest land, and for its implementation.

This letter-size booklet with two-column pages has a very attractive format with a forest motif, and is further enhanced by a few excellent photographs.

Forestry in Sweden is an authentic treatise on the phases covered, by one of Sweden's outstanding forestry authorities. It is "must" reading for every American student of the subject.

R. E. MARSH

The Living Forest

By Jack McCormick. 127 pp. Illus. Harper & Brothers, New York. 1958. $3.95.

Ten years ago, Dr. Albert E. Parr, director of the American Museum of Natural History in New York City, initiated an exhibition project based on the forests of North America. In May 1958, the Hall of North American Forests was opened to the public. Among the many experts contributing to the exhibit, the most comprehensive of its kind in the world, was Dr. Jack McCormick, director of vegetation studies at the American Museum. Drawing upon material collected in a decade of research, Dr. McCormick has written an interpretation of the Hall of Forests.

The Living Forest is not an indexed description of each exhibit, but rather an explanation of the forest community with reference to the various exhibits. Although written for the general reader, basic concepts of the forest sciences are described in a technical manner. The initial presentation, that of life chains and predators, is very concise and indicative of the pattern that follows. As one progresses through the 127 pages it becomes quite clear that Dr. McCormick undertook no small task. Each of the nine chapters is composed in a unique manner that extracts the highlights from a series of exhibits. More than 50 percent of the text is devoted to a chapter on forest insects and one on forest tree diseases. The life cycles and destructive activities described will add greatly to the layman's understanding of these problems.

A chapter titled "Stories a Stump Can Tell" adds a historical note to the book. Beginning with a discussion of annual rings it continues with examples of extremes in rates of growth. Reference is made to the Laboratory of Tree-Ring Research at the University of Arizona. Illustrated is a section from a California bristlecone pine which existed for 4,500 years. It is the oldest authentically dated tree in the world. A section from the Mark Twain giant sequoia, 1,341 years old, is shown. There is a description of the Discovery Tree, a limber pine from Idaho showing a branch section, maximum radius of 9.5 inches, 1,550 years old, less then one-tenth the size of the Mark Twain sequoia and 219 years older. It represents the slowest annual growth rate ever observed in a

North American tree—3mm per century.

Foresters and laymen alike will appreciate the splendid illustrations by Matthew Kalmenoff of the American Museum. He has contributed over 90 pen and ink sketches to supplement the numerous photographs. Those depicting insect and disease activity show remarkable attention to detail.

A significant exhibition can now benefit those unable to visit the museum. Dr. McCormick presents a refreshing introduction to forest life that merits the attention of all who are interested in woodlands.

ALBERT CLEPPER
Arlington, Va.

Conservation of Natural Resources

Edited by Guy-Harold Smith. 2nd ed. 474 pp. Illus. John Wiley & Sons, New York. $8.50.

The first edition of this college text appeared in 1950. Again, it is a composite volume representing the individual contributions of 19 authors. A very creditable job of editorship has been accomplished by Guy-Harold Smith. Despite this, there are some discordant gradations in the level of objectivity of the various chapters. But, this is to be expected. The editor candidly pre-conditions the wary reader by saying "... the philosophy of each contributor has been retained." Your reviewer is disposed to criticize some of the residual philosophy and lament some of the resource data omitted.

The book is comprised of 23 separate chapters. Each of these is an entity which concerns itself with one phase of our conservation picture. The subject coverage is good including, among others, the public domain, soils, irrigation, reclamation, grasslands, forests, water problems, minerals, and wildlife. Five new authors make their appearance in this edition. The first edition contained a chapter on "Tree Crops." This has been replaced in the current edition with "Economics and Conservation." This change may be an imperceptible improvement, but no more.

For those who prefer their conservation presented in a censorious fashion, there is a modicum of apostolic thundering and finger-pointing. Fortunately, this has been kept to a minimum. Most of the chapters have the amoral quality of adequate subject matter treatment.

This is a good text on the natural resources of our country. Some will find fault with its undue attention to the past as a necessary historical chronology of import and claim a lack of adequate space devoted to the current resource situation. Fortunately, the text seldom becomes prophetic.

The reviewer frequently opines that it is not good editorial practice to request objective text or lecture materials from writers or speakers who have previously had the responsibility of subjectively organizing the very program for which portrayal is required. The "avantgard" are indispensable. But not as teachers. For example, some of the older foresters and agriculturists will be surprised to find that the soil conservation districts are "farmer-organized, farmer-operated governmental unit (s)."

Foresters will be glad to know that the two too-brief chapters on forest resources have been capably handled again by O. D. Diller, Ohio Agriculture Experiment Station. Only modest changes have been made in the forestry presentation since the previous edition. Some of our more venturesome foresters will suggest added emphasis should have been given to the effect of new utilization and management trends on the wood resource. However, the basic facts have been presented.

This book is a laudable account of a large, and often contentious, field. Although tending to run heavily toward charts and maps, the illustrations are good. Each chapter is accompanied by a well-chosen set of selected references.

As a text, the book is commendable both as to scope and quality of content. As vocational reading, the verbiage must frequently be assessed with some sort of graceful tolerance.

PAUL R. KRAMER
Texas Forest Service

The Colonel William B. Greeley Lectures in Industrial Forestry

No. 1. Development of Industrial Forestry in the Pacific Northwest, By Axel J. F. Brandstrom. 33 pp. Illus. 1957. No. 2. History of Industrial Forestry in the South. By Frank Heyward. 50 pp. Illus. 1958. University of Washington, Seattle. No price indicated.

The Industrial Forestry Association, a dynamic, pay-as-you-go group, might be described as an agency to carry on and extend the forestry work organized in the Northwest by Col. Greeley after his term as chief of the Forest Service. These lectures are the first two of a series of five, provided by a grant of the association.

The lectures are noteworthy for their breadth and for the wealth of specific facts they bring together, on the birth and evolution of American forestry as an economic engine, able to generate its own fuel but also to help support local, state, and federal governments. The lectures trace the steps from former over-abundance to a more balanced present, and they tell who did what and why he did it. Of special interest to JOURNAL readers are brief reviews of the parts played by individual foresters and forest-minded companies, whose contributions are described with both clarity and maturity.

Anyone who may expect to find encomiums on Col. Greeley will need to look elsewhere than in these lectures dedicated to his memory. No doubt the Colonel would want it that way, for he was an objective observer, and a promoter of forestry rather than of his own career. This quality of cool appraisal, on the merits, helped to make his work effective in composing differences between

strong personalities of diverse interests.

The lectures reflect the same objective viewpoint. They are absorbing accounts, with the sparkle of discovery, together with bits of regional pride, so evident when foresters from the Northwest and the South get together. The stilted mannerisms of the pundit will not be found here, nor mere enumeration of events and causes that brought them about. The freshness of treatment, again reminds one of a facet of Col. Greeley's personality.

Both Brandstrom and Heyward have had much experience in field and office in their own areas, and under varied auspices. Brandstrom graduated from the academic halls of Washington's College of Forestry into the logging woods of 1919, coming back to his Alma Mater nine years later to teach engineering. In 1930 he joined the U. S. Forest Service Experiment Station at Portland. There he worked and wrote industriously for ten years, when Crown Zellerbach claimed his services until 1946. Since then he has operated his own business as a consulting forester in the Northwest and British Columbia.

Heyward, with degrees from Michigan and California, went to the forest experiment station at New Orleans in 1930, to work with "Cap" Eldredge and many others until 1937, when he was made state forester of his native Georgia. Two years later he became forester and general manager of the Southern Pulpwood Conservation Association, then a-borning. In 1946 he went with tree-planting Gaylord Container Corporation (now a division of Crown Zellerbach) where he is director of public relations. He lent a clarifying vision as well as his usual industry to production boards in Washington during World War II and the Korean affair. Both lecturers have proved their faith by acquiring ownership for themselves of significant amounts of forest land.

Brandstrom and Heyward both start at the beginning, with the shipment of clapboards from Jamestown in 1608. From there they trace briefly the growth of the great lumber industry in their respective parts of the country, including the long periods when lumber was too cheap to sell and wild fire was a terrible menace to life and solvency. Both lecturers understand the earlier times well enough to avoid the scolding habit that long hindered the progress of forestry. They show the evolution of thought and action that began long before rising tides in the wood markets made forestry feasible as a business able to compete for money and management ability. Both have seen the paper industry providing steadier markets and closer utilization. They show how today the wood-using industries are fast transforming themselves, as we like to think, into integrated forestry enterprises.

Fortunate readers of these lectures will have their appetites whetted for the remaining three of the series, whose subjects are matters of interesting speculation. Non-readers will deny themselves a treat.

HERMAN WORK
Staunton, Va.

Publications of Interest

Tree Diameter as a Guide to Thinning Southern Pine by H. C. Mitchell, published by the Soil Conservation Service, deals with the use and application of the $(D+x)^2$ spacing formula in forest management. Both the application of the formula and the basis for its development are presented in this 16-page bulletin. SCS technicians have used this spacing principle in judging stand density preparatory to prescribing silvicultural treatment for over 15 years. Available on request from the SCS, U. S. Dept. Agric., Washington 25, D. C.

* * *

A. J. Nash of the School of Forestry, University of Missouri, has prepared a 74-page booklet, *Elementary Statistics for Foresters*, which he hopes will serve as an elementary text in statistics for forestry students and will also be useful as a reference for solution of basic problems to those working in forestry. The work covers graphic presentation of data, means and class intervals, normal frequency distribution, standard error, and sampling theory. Copies are available from Lucas Brothers Publishers, Columbia, Mo. No price is indicated.

* * *

During the past 18 years the Interstate Commission on the Potomac River Basin has been working to control pollution of the Potomac. The commission, made up of representatives from the District of Columbia, Maryland, Pennsylvania, Virginia, West Virginia, and the federal government, has reported on its efforts and progress in *Teamwork on the Potomac*. Copies of the 68-page booklet may be obtained by writing to the commission, Suite 203, Transportation Building, Washington 6, D. C.

* * *

The Forest Service, U. S. Department of Agriculture, has just released a new film *The President Plants a Tree* (16mm color, sound, 7 minutes).

The White House has special significance for all Americans. Each President has left his mark upon his country's "official" residence. Some of the finest contributions to its beauty are the trees which our Presidents have planted on the White House grounds. A number of these trees, whose planting coincide with historic events, are shown in their present-day splendor. Here, in turn, President Eisenhower plants the tree of his selection for future generations to enjoy.

This film is appropriate for supplementing teaching of social studies. Grade 4 to adults.

* * *

A new 16 mm, color-sound film entitled *New Horizons for Wood* has been produced and released by the State University College of Forestry at Syracuse University. The film was written and directed by Dr. William M. Harlow and explores the structure and physical and chemical properties of wood as studied by research scientists at the college's Hugh P. Baker Memorial Laboratory. Running time: 28 minutes. The film may be purchased for $140. To borrow or purchase contact: Forest Extension and Public Relations Div., State University College of Forestry at Syracuse University, Syracuse 10, N. Y.

Current Literature

Compiled by MARTHA MEELIG, *Librarian, State University College of Forestry at Syracuse University*

Range Management Section Compiled by NELLIE G. LARSON, *Library, U. S. Department of Agriculture*

General

Angelique . . . By B. F. Kukachka. 8 pp. Tables. U. S. Forest Products Lab., Madison, Wis. 1958. Foreign Wood Ser. Rept. No. 1787 (revised).

Bladen Lakes State Forest. By G. V. Chamblee. 41 pp. Illus. North Carolina Dept. of Conserv. & Development. 1958.

The Massabesic Experimental Forest . . . By T. W. McConkey and W. E. Smith. 21 pp. Illus. Northeastern Forest Expt. Sta., Upper Darby, Pa. 1958. Sta. Paper No. 108.

Penn's Woods West. By E. L. Peterson. 249 pp. Photographs by T. M. Jarrett. Univ. of Pittsburgh Pr., Pittsburgh, Pa. 1958. $15.

Timber and Forest Products Law. By H. W. Falk, Jr. 384 pp. Howell-North Books, Berkeley, Calif. 1958. $7.50.

Christmas Trees

The Christmas Tree Industry in Canada. 3d ed. By H. M. Babcock and J. E. Nicolaiff. 16 pp. Canada Dept. of Northern Affairs & National Resources. Forestry Branch. 1958. Misc. Publ. No. 10.

Douglas Fir Varietal Tests for Christmas Tree Plantations in Pennsylvania. By W. R. Byrnes, H. D. Gerhold and W. C. Bramble. 5 pp. Illus. Pennsylvania State Univ. Agric. Expt. Sta., University Park. 1958. Progress Rept. No. 198.

Conservation

Highlights in the History of Forest Conservation. (Revised) 23 pp. U. S. Forest Serv., Washington 25, D. C. 1958. Agric. Info. Bul. No. 83. 15 cents.

Perspectives on Conservation: Essays on America's Natural Resources. Ed. by Henry Jarrett. 272 pp. Johns Hopkins Pr., Baltimore, Md. 1958. Resources for the Future, Inc. $5.

Farm Forestry

Managing a Small Forest in East Texas. By C. B. Gibbs. 7 pp. Illus. Southern Forest Expt. Sta., New Orleans, La. 1958. Occasional Paper No. 163.

Forest Management

Management of Bottomland Forests; Proceedings Seventh Annual Forestry Symposium April 10-11, 1958. 114 pp. Louisiana State Univ. School of Forestry, Baton Rouge.

Three Diameter-Limit Cuttings in West Virginia Hardwoods, a 5-Year Report. By R. J. Hutnik. 13 pp. Illus. Northeastern Forest Expt. Sta., Upper Darby, Pa. 1958. Sta. Paper No. 106.

Timber Management Plan Coeur d'Alene Working Circle, Coeur d'Alene National Forest, Idaho. 101 pp. U. S. Forest Serv., Washington 25, D. C. 1958.

Forest Products

Marketing Forest Products in West Virginia. By W. W. Christensen and A. W. Goodspeed. 33 pp. West Virginia Univ. Agric. Expt. Sta., Morgantown. 1958. Bul. No. 421.

Logging and Milling

Log-Gang and Scrag Mills' Sawing Efficiency. By J. R. Pfeiffer. 20 pp. Forest Products Research Center, Corvallis, Ore. 1958. Information Cir. No. 11.

Range Management

Cattle Grazing in Longleaf Pine Forests of South Mississippi. By L. F. Smith, R. S. Campbell, and C. L. Blount. 25 pp. Illus. Southern Forest Expt. Sta., New Orleans, La. 1958. Occasional Paper No. 162.

Responses of Vegetation to Fire; A Study of Herbaceous Vegetation Following Chaparral Fires. By J. R. Sweeney. Calif. Univ. Pubs. in Bot. V. 28, No. 4, pp. 143-249. Illus. Berkeley, 1956. $2.

Sagebrush Eradication and Broadcast Seeding. By C. W. Cook. 23 pp. Illus. Utah Agric. Expt. Sta., Logan. 1958. Bul. No. 404.

Seasonal Development and Yield of Native Plants on the Upper Snake River Plains and their Relation to Certain Climatic Factors. By J. P. Blaisdell. 68 pp. Illus. U. S. Dept. Agric., Washington 25, D. C. Tech. Bul. No. 1190.

Supplements for Range Cows. By J. H. Knox and W. E. Watkins. 9 pp. New Mexico Agric. Expt. Sta., State College. 1958. Bul. No. 425.

Silviculture

Control of Cull Trees and Weed Species in Hardwood Stands. By E. R. Sluder. 13 pp. Illus. Southeastern Forest Expt. Sta., Asheville, N. C. 1958. Sta. Paper No. 95.

How to Transplant Trees and Shrubs. By D. B. Lacey and A. N. Lentz. 4 pp. Illus. Rutgers State Univ. Ext. Serv., New Brunswick, N. J. 1958. Leaflet No. 246.

Lodgepole Pine in the Blue Mountains of Northeastern Oregon. By J. M. Trappe and R. W. Harris. 22 pp. Illus. Pacific Northwest Forest & Range Expt. Sta., Portland, Ore. 1958. Research Paper No. 30.

Planting Pine in the Carolina Sandhills. By R. D. Shipman. 43 pp. Illus. Southeastern Forest Expt. Sta., Asheville, N. C. 1958. Sta. Paper No. 96.

Relationship of Site Conditions to Establishment and Early Growth of McKee Hybrid Poplar. By H. B. Kriebel, G. L. Lowry and W. K. Murphey. 11 pp. Illus. Ohio Agric. Expt. Sta., Wooster. 1958. Res. Cir. No. 53.

Rooting Habits of Lodgepole Pine. By K. W. Horton. 26 pp. Illus. Canada Dept. of Northern Affairs & National Resources. Forestry Branch. 1958. Tech. Note No. 67.

Silvical Characteristics of Sitka Spruce. By R. H. Ruth. 19 pp. Illus. Pacific Northwest Forest and Range Expt. Sta., Portland, Ore. 1958. Silvical Ser. No. 8.

Silvical Characteristics of White Fir. By D. C. Maul. 22 pp. California Forest and Range Expt. Sta., Berkeley. 1958. Tech. Paper No. 25.

Silvics of Black Cottonwood. By A. L. Roe. 18 pp. Illus. Intermountain Forest and Range Expt. Sta., Ogden, Utah. 1958. Misc. Publ. No. 17.

Transplanting of Trees and Shrubs in the Northeastern and North Central United States. 73 pp. Illus. National Shade Tree Conference and National Arborist Ass'n. Collier Printing Co., Wooster, Ohio. rev. 1958.

Tree Planting in Southern California. By P. C. Sischo. 28 pp. Illus. California Dept. of Natural Resources. Div. of Forestry. 1958.

Weeding the Woodlot with Chemicals. By A. N. Lentz. 4 pp. Illus. Rutgers. State Univ. Ext. Serv., New Brunswick, N. J. 1958. Ext. Bul. No. 317.

Wildlife Management

Forestry and Deer in the Pine Region of New Jersey. By S. Little, G.R. Moorhead and H. A. Somes. 33 pp. Illus. Northeastern Forest Expt. Sta., Upper Darby, Pa. 1958. Sta. Paper No. 109.

Wood Preservation

Relative Effectiveness of Several Oil-Soluble Wood Preservatives; Condition of Dip-Treated Stake and Boardwalk Assemblies Exposed One Year to Decay and Termite Attack. By R. Z. Zabel and R. A. Moore. 7 pp. Illus. Reprint from Forest Products Journal, Sept. 1958. Available from Dr. Zabel, State Univ. College of Forestry, Syracuse 10, N. Y.

Wood Technology and Utilization

Chemical Research at U. S. Forest Products Laboratory. By E. G. Locke. 18 pp. U. S. Forest Products Lab., Madison, Wis. 1958. Rept. No. 2134.

Hardboard from Red Alder and from a Mixture of Slow-Growth Southern Oaks. By S. L. Schwartz. 8 pp. U. S. Forest Products Lab., Madison, Wis. 1958. Rept, No. 2125.

A *Method of Calculating Internal Stresses in Drying Wood.* By R. L. Youngs. 18 pp. U. S. Forest Products Lab., Madison, Wis. 1958. Rept. No. 2133.

Society Affairs

First Call for Council Nominations

All members are hereby notified that the regular biennial election will be held December 5, 1959. A president, vice president, and nine other members of the Council will be elected for the two-year term 1960-1961.

The present Council is listed in the box below. Any or all of these incumbents may be renominated, provided they accept the nomination in writing.

President George A. Garratt has announced that he will not be a candidate for re-election.

Membership on the Council is restricted by the Constitution to Members (formerly Senior Members) and Fellows. Any Member or Fellow is eligible to hold office who is in good standing and who accepts the nomination in writing and declares his willingness to serve if elected.

Each voter will have an opportunity to ballot on all candidates for office. Council members are elected in accordance with the system of proportional representation. The procedure of proportional representation will be explained in a later issue of the JOURNAL. It is the system by which the Society has been electing Council members for more than two decades.

Table 1 shows the distribution of Council members by states during the past seven biennial terms of office (1944-1959).

Candidates for the office of president are voted on separately; the candidate who receives the highest vote is declared elected president, and the candidate who receives the next highest vote is declared elected vice president. Thus all candidates for president are considered as nominated also for vice president.

How Nominations Are Made

The Constitution (Article VIII, Section 2) states the conditions under which nominations are made by petition.

1. Each petition shall name but one candidate.
2. All candidates must be eligible to hold elective office.
3. A petition shall bear the signatures of at least ten voting members who at the time of signing the petition are eligible to vote in the coming election. (Eligible voting members are Junior Members, Members, and Fellows in good standing.)
4. A voting member may not sign more than one nominating petition for president or more than one nominating petition for a member of the Council. That is, he may sign two, but no more.
5. Petitions must be in the Society office by September 19, 1959.

The Society has no special form for submitting nominating petitions. They may be written as follows:

We, the undersigned voting members of the Society of American Foresters, hereby nominate John Doe, a Member (or Fellow) for the office of president (or member of the Council) for the two-year term 1960-1961.

Officers and Council
1958-1959

GEORGE A. GARRATT, *President*
School of Forestry
Yale University
New Haven 11, Conn.

B. E. ALLEN
Union Bag-Camp Paper Corporation
P. O. Box 570
Savannah, Ga.

PHILIP A. BRIEGLEB
Southern Forest Experiment Station
704 Lowich Building
2026 St. Charles Avenue
New Orleans 13, La.

DONALD E. CLARK
U. S. Forest Service
Federal Center, Building 85
Denver 7, Colo.

HENRY J. MALSBERGER, *Vice President*
Southern Pulpwood Conservation Association
900 Peachtree Street, N. E.
Atlanta 9, Ga.

CHARLES A. CONNAUGHTON
U. S. Forest Service
630 Sansome Street
San Francisco 11, Calif.

KENNETH P. DAVIS
School of Natural Resources
University of Michigan
Ann Arbor, Mich.

MAURICE K. GODDARD
Department of Forests and Waters
Harrisburg, Pa.

HENRY CLEPPER, *Executive Secretary*
Mills Building, 17th Street at Pennsylvania Avenue, N. W.
Washington 6, D. C.

WILLIAM D. HAGENSTEIN
Industrial Forestry Association
1410 S. W. Morrison Street
Portland 5, Ore.

J. HERBERT STONE
U. S. Forest Service
729 N. E. Oregon Street
Portland 8, Ore.

HENRY J. VAUX
School of Forestry
University of California
Berkeley 4, Calif.

The form of acceptance of a nomination may read as follows:

"I accept the nomination to the office of President (or to membership on the Council) of the Society of American Foresters for the two-year term 1960-1961, and agree to serve if elected."

No nomination will be considered valid unless supported by the nominee's acceptance in writing.

All nominating petitions should be sent promptly to the Society office, 425 Mills Building, Washington 6, D. C. The executive secretary will gladly provide information about nominating or election procedure.

According to the Constitution (Article VIII, Section 1) a Nominating Committee has been appointed by President Garratt. The Committee is composed of the following members:

Chairman, Harry Wm. Dengler, Extension Service, University of Maryland, College Park, Md.

Earl J. Adams, 4705 Tenth Avenue South, Minneapolis 7, Minn. (State Division of Forestry.)

Robert R. Mitrodragovich, U. S. Forest Service, Cody, Wyo.

Harry M. Roller, Jr., Woodlands Department, International Paper Company, Mobile 9, Ala.

George Stenzel, College of Forestry, University of Washington, Seattle 5, Wash.

This committee is charged with the following duties:

1. To set the date of the election. (December 5, 1959, is the date.)

2. To provide for at least two candidates for the office of president, and at least nine candidates for membership on the Council.

3. To receive separate nominating petitions for the office of president and for each member of the Council, and to supplement such petitions when necessary with other nominations in order to comply with item 2 above.

The Nominating Committee will make no nominations of its own unless the voting membership fails to make the required minimum number of nominations by petition. Voting members should accordingly get busy and make their own nominations. For their information the distribution of Council members by states during the period 1944-1959 is shown in Table 1.

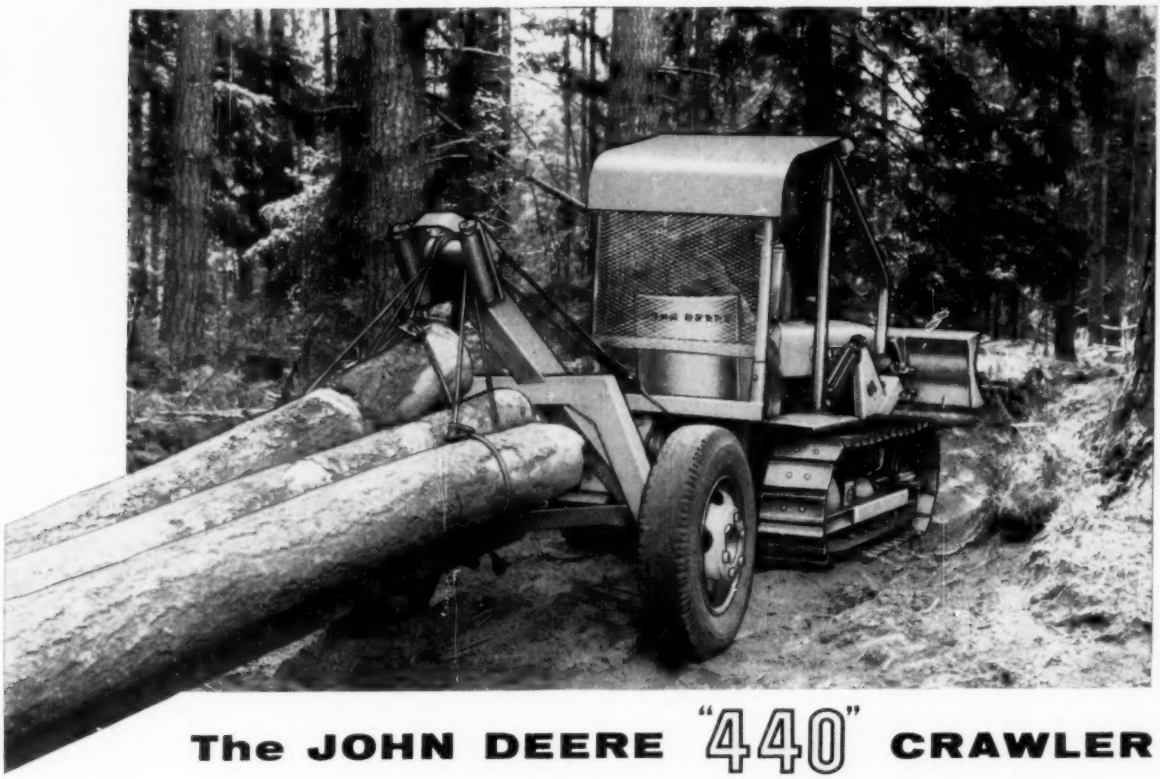
A petition has already been received, placing Henry J. Malsberger of Atlanta, Ga., in nomination for the office of president.

HARRY WM. DENGLER, *Chairman*
Nominating Committee

TABLE 1.—DISTRIBUTION OF COUNCIL MEMBERS BY STATES DURING PERIOD 1944-1959
(Presidents' names are in capital letters; vice presidents', in italics)

State	1944-1945	1946-1947	1948-1949	1950-1951	1952-1953	1954-1955	1956-1957	1958-1959
Alabama				Porter, Earl	Porter, Earl			
California	Baker, F. H. Keen, F. P.		Nelson, DeWitt	Nelson, DeWitt	Thompson, P. A.	*Nelson, DeWitt*	NELSON, DEWITT Vaux, H. J.	Connaughton, C. Vaux, H. J.
Colorado			Spencer, J. W.					Clark, D. E.
Connecticut	Hawley, R. C.						*Garratt, G. A.*	GARRATT, G. A.
Dist. of Columbia			McArdle, R. E.	McArdle, R. E.	McArdle, R. E.			
Florida						Coulter, C. H.	Coulter, C. H.	
Georgia		Evans, C. F.	*Evans, C. F.*	EVANS, C. F.			Allen, B. E.	Allen, B. E. *Malsberger, H.*
Idaho		Evenden, J. C.	Evenden, J. C.					
Illinois		Coffman, J. D.						
Louisiana							Briegleb, P. A.	Briegleb, P. A.
Maine				Demeritt, D. B.	Demeritt, D. B.	Demeritt, D. B.		
Michigan	*Allen, S. W.*	ALLEN, S. W.		Fontanna, S. G.		Fontanna, S. G.	Fontanna, S. G.	Davis, K. P.
Minnesota	SCHMITZ, H.			Kaufert, F. H.	Kaufert, F. H.			
Missouri					Westveld, R. H.	Westveld, R. H.		
Montana	Smith, G.					Hanson, P. D.		
New Hampshire		Herr, C. S.	Herr, C. S.	*Herr, C. S.*				
New Mexico				Lindh, C. O.	Lindh, C. O.			
New York	Reeknagel, A. B.	Reeknagel, A. B.				Illick, J. S.	Illick, J. S.	
North Carolina	Damtoft, W. J.	Damtoft, W. J.			*Demmon, E. L.*	DEMMON, E. L.		
Oregon		Dunn, P. M.	Dunn, P. M.	Brundage, F. H.		Stone, J. H.	Stone, J. H.	Hagenstein, W. Stone, J. H.
Pennsylvania	Shirley, H. L.						Goddard, M. K.	Goddard, M. K.
South Carolina			Flory, C. H.					
Tennessee			Baker, W. M.					
Washington	Greeley, W. B.	Greeley, W. B. *Martin, C. S.*	Greeley, W. B. MARTIN, C. S.	Marckworth, G.	DRAKE, G. L. Marckworth, G.	Heacox, E. F.	Heacox, E. F.	
Wisconsin	Price, J. H.	Price, J. H.			Brown, W. J.	Brown, W. J.		

STAND CLEAR! Champion Cost-Cutter Going By!

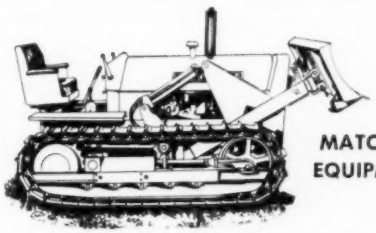


The JOHN DEERE "440" CRAWLER

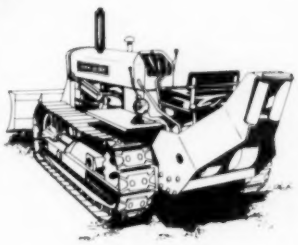
Skidding out tree-length logs each trip, this "440" with John Deere 100 Log Arch is running up big savings for its owner every day. And whether it's shuttling logs, building landings, loading trucks, or plowing fire lines, this woods-wise crawler pays dividends in maneuverability and operating ease, too.

The clutch-type direction reverser, free-spooling Gearmatic winch and big-capacity hydraulic system are just three reasons why versatile John Deere Crawlers give economical performance on every logging job. Now, with your choice of Diesel or gasoline power, you can make even greater savings by picking the unit that best fits into your over-all operation.

Clip the coupon for complete information today!



MATCHED EQUIPMENT



High-lift, inside- or outside-mounted John Deere Bulldozers do double duty in building roads and bunching logs. Newly announced, the close-coupled John Deere 150 Integral Log Arch (right) greatly increases work capacity.

JOHN DEERE
LOGGING
Tractors and Equipment

"Especially Engineered for the Woodlands"

SEND FOR FREE LITERATURE

JOHN DEERE INDUSTRIAL DIVISION
Moline, Illinois • Dept. D-78-H

Please send me your latest literature on the John Deere Crawler Tractors and Equipment.

Name _____

Firm _____

Address _____

City _____ *State* _____

First Call for Fellow Nominations

All Members (formerly Senior Members) and Fellows of the Society are hereby advised that nominations for the grade of Fellow are now open. The election of Fellows will be held at the time of the Society's regular biennial election, December 5, 1959.

As defined by the Constitution (Article III, Section 7), "Fellows shall be foresters recognized generally throughout the profession as persons who have rendered outstanding service to forestry and to the Society. They shall be elected from the Members."

Nominations by Petition

The procedure for placing Members in nomination for the grade of Fellow is by petition. The Society has no printed form for this purpose; the petition may be typewritten thus:

We, the undersigned Members and Fellows of the Society of American Foresters, hereby nominate John Doe for election to the grade of Fellow in 1959.

Remember these simple rules:

1. A petition may not name more than one candidate.
2. It must be signed by not less than 25 Members or Fellows in good standing.
3. It should be accompanied by a factual, not eulogistic, biographical sketch of at least 300 words giving an account of the nominee's professional career and accomplishments.
4. It must be received in the executive office of the Society in Washington, D. C., not later than September 19,1959.

The executive employees of the Society cannot be responsible for obtaining signatures on partially completed petitions or on petitions incomplete by reason of unacceptable signatures (that is, signatures of other than Members and Fellows in good standing).

Election Procedure

Fellows are not elected by the membership at large, but by a board of electors which consists of all present Fellows, the Council, the chairmen of the 21 Sections, and the chairmen of the 9 subject Divisions.

The system is described in Article IV, Section 4 of the Constitution. To win election a nominee must receive an affirmative vote of not less than one-half the total number of votes cast, as provided in Bylaw 11.

For the 1959 election there will be 129 electors, of whom 89 are Fellows. An elector has one vote only. A Fellow who is also a Council member has but one vote.

Significance of the Grade

The highest membership distinction that can be conferred by the Society, this grade is awarded in recognition of outstanding service to forestry and to the Society. Fellows do not pay increased dues; their dues are the same as those of Members.

Since the Society was founded in 1900, there have been 125 Fellows elected. At the present time the number of living Fellows is 89.

Since the last election in December 1957, two Fellows have died: S. R. Gevorkiantz of Minnesota and J. S. Holmes of North Carolina.

List of Fellows

The current roster of Fellows fol-

SAFEST, SIMPLEST DRIP TORCH YOU CAN USE

FORESTER Seal-Tite Torch

Provided with fuel trap, check valve and flash-back screen to protect you from explosion hazards.

Welded tank with cushion base, double bottom, oil proof gaskets and tight valves SEALTITE against leakage.

No Pressure—No Preheating. Burns diesel oil, stove oil or mixed fuels with low flash-point.

Approved for use by U. S. Forest Service

Manufactured By

WESTERN FIRE EQUIPMENT CO.

69 Main St. San Francisco, California

It's easy to grow your trees and shrubs from SEED

free PLANTING GUIDE

Tells you how to raise them from seed . . . beautiful evergreens, lovely trees and shrubs for shade, ornament, windbreak, snow fence, erosion control. Descriptions of trees and shrubs that are best suited to your soil and climate—to help you select the trees and shrubs for your purpose. Seeds normally produce seedlings in a few days or weeks. Transplant from garden or seed bed when conditions of soil and weather are most favorable.

For price list and Free Planting Guide write to

WOODLOT SEED CO. Since 1936 NORWAY 44 - MICH.

The SCHOOL That Comes to YOU

If you live in an isolated area, Calvert SCHOOL-AT-HOME Courses can provide, by mail, a modern education for your child. Kindergarten through 8th grade courses stress the three R's, science, and cultural subjects. They are kept up to date by continuous pretesting in Calvert's famous laboratory-school.

YOU NEED NO TEACHING EXPERIENCE

Parents are supplied with complete step-by-step teaching instructions. Calvert Courses are often used to enrich the educational experience of the above-average child. Start any time, transfer easily to other schools. 53rd year. Non-profit.

Catalog (give age, grade): 950 Tuscany Rd., Baltimore 10, Md.

CALVERT SCHOOL

Talcott Brothers load 4,500 bf of logs on their truck in less than 20 minutes. Former method required up to two hours.

How double-duty TD-9 Skid-Grapple helps logger-ranchers prosper!

Operating near Glide, Oregon, brothers Neil and Watson Talcott used to handle logs "the hard way."

Using a block-and-tackle and an old crawler, they needed up to two hours to load 4,500 bf of logs on their trucks. Now, with their International Drott TD-9 Skid-Grapple, they do the job in 15 to 20 minutes!

Using the TD-9 Skid-Grapple to skid logs, and load, too, this brother team has their second truck-load of logs "wheeling" to the mill by early afternoon—instead of after sundown. Production: 9,000 bf in a "long" half-day!

"The TD-9 Skid-Grapple has speeded up our production remarkably," report the Talcotts. "We take advantage by working fewer hours in the woods and giving our ranch work the attention it needs.

"Before, with the two of us felling, bucking, skidding, loading, and hauling to the sawmill, it was back-breaking dawn-to-dark labor. Now, the Skid-Grapple does most of the hard work. We make more money and take it easy."

Here's the Talcott's TD-9 Skid-Grapple with "both ends busy"—speeding logs to the truck. International Drott Skid-Grapples come in models matched to your requirements.

Prove the profit advantages of minimum crew operation—using the bonus-powered International Drott Skid-Grapple to skid and load logs. Compare exclusive top grab-arm action for positive load control and operating ease. See how exclusive Hydro-Spring swallows shock, protects equipment. See your International Drott Distributor for a demonstration.

International Harvester Company, Chicago 1, Illinois
Drott Manufacturing Corp., Milwaukee 15, Wisconsin

INTERNATIONAL®
DROTT

CUT COSTS 90%
PREVENT ACCIDENTS

• WASH WINDOWS FOUR STORIES HIGH

REMOVE LIGHT GLOBES 60 ft. up

• PRUNE TREES & PICK FRUIT 60 ft. up

Send for Free Catalog
DEPT. J . 300 S. Los Angeles St. L.A. 13. MA 6-9397

TM MODEL

Lowther Heavy duty tree planters insure deep penetration and straight root systems.

Our Sod Scalpers aid survival and growth.

Six distinctly different models available to cover all soil and terrain conditions.

•

For details write

HARRY A. LOWTHER COMPANY
BOX 1412, JOLIET, ILLINOIS

lows. The state in which each Fellow is domiciled and the year of his election are shown after his name.

Allen, Shirley W. Michigan. 1948.
Bailey, Reed W. Utah. 1955.
Baker, Frederick S. California. 1949.
Besley, Fred W. Maryland. 1940.
Boyce, John S. Connecticut. 1955.
Brundage, Frederick H. Oregon. 1949.
Butler, Ovid. Maryland. 1940.
Carter, E. E. District of Columbia. 1942.
Chapman, Herman H. Connecticut. 1922.
Clapp, E. H. District of Columbia, 1930.
Clepper, Henry. Virginia. 1949.
Coffman, John D. California. 1946.
Coulter, C. Huxley. Florida. 1957.
Cowan, Charles S. Washington. 1957.
Cox, William T. Minnesota. 1953.
Curran, Hugh. Venezuela. 1951.
Damtoft, W. J. North Carolina. 1951
Dana, Samuel T. Michigan. 1935.
Demeritt, Dwight B. Maine. 1955.
Demmon, E. L. North Carolina. 1951.
Detwiler, Samuel B. Colorado. 1955.
Drake, George L. Washington. 1953.
Dubuar, James F. New York. 1957.
Eldredge, Inman F. Louisiana. 1942.
Evans, Charles F. Georgia. 1949.
Evenden, J. C. Idaho. 1953.
Ferguson, J. A. Pennsylvania. 1949.
Fischer, Arthur F. California. 1940.
Fontanna, Stanley G. Michigan. 1955.
Frank, Bernard. Maryland. 1957.
Fritz, Emanuel. California. 1951.
Frothingham, E. H. California. 1942.
Garratt, George A. Connecticut. 1953.
Garrison, Paul M. Louisiana. 1957.
Gill, Tom. District of Columbia. 1948.
Granger, C. M. Maryland. 1946.
Guise, Cedric H. New York. 1951.
Guthrie, John D. Virginia. 1942.
Hall, J. Alfred. Wisconsin. 1955.
Hall, William L. Arkansas. 1940.
Hartley, Carl P. Maryland. 1949.
Hawes, Austin F. Connecticut. 1939.
Hawley, Ralph C. Connecticut. 1942.
Heacox, Edwin F. Washington. 1957.
Heiberg, Svend O. New York. 1957.
Heintzleman, B. Frank. Alaska. 1951.
Hosmer, Ralph S. New York. 1932.
Hunt, George M. Wisconsin. 1951.
Illick, Joseph S. New York. 1946.
Isaac, Leo A. Oregon. 1953.
Jeffers, Dwight S. Oregon. 1948.
Kaufert, Frank H. Minnesota. 1955.
Keen, Frederick P. California. 1955.
Kelley, E. W. California. 1949.
Kellogg, Royal S. Florida. 1949.
Kinney, Jay P. New York. 1942.
Kircher, Joseph C. Florida. 1957.
Kittredge, Joseph. California. 1953.
Korstian, C. F. North Carolina. 1942.
Krueger, Myron. California. 1951.
Lowdermilk, Walter C. California. 1948.
Lutz, Harold J. Connecticut. 1957.
MacDonald, G. B. Iowa. 1944.
Marckworth, G. D. Washington. 1955.
Marsh, R. E. District of Columbia. 1948.
Martin, Clyde S. Washington. 1948.
Mason, David T. Oregon. 1948.
McArdle, R. E. District of Columbia. 1953.
Merrill, Perry H. Vermont. 1957.
Metcalf, Woodbridge. California. 1953.
Morrell, Fred W. Virginia. 1951.
Munger, Thornton T. Oregon. 1946.
Munns, Edward N. California. 1949.
Nelson, DeWitt. California. 1957.
Porter, Earl. Alabama. 1957.
Preston, J. F. District of Columbia. 1948.
Price, Jay H. Arizona. 1951.
Reynolds, R. R. Arkansas. 1957.
Schmitz, Henry. Washington. 1940.
Shirley, Hardy L. New York. 1951.
Show, S. B. California. 1948.
Siecke, E. O. Texas. 1946.
Sparhawk, W. N. New Hampshire. 1946.
Wahlenberg, W. G. North Carolina. 1957.
Wakeley, Philip C. Louisiana. 1957.
Watts, Lyle F. Oregon. 1946.
Winslow, C. P. Dist. of Columbia. 1942.
Wirt, George H. Pennsylvania. 1948.
Ziegler, E. A. Pennsylvania. 1949.

FOREST SEEDS of CALIFORNIA
R. S. Adams & A. P. Baal
Professional Foresters
P.O. Box 561 — Davis, California
since 1952

Council's Column

Attention Foresters

An undertaking now in the process of unfolding deserves the full attention of the forestry profession. This development is a result of legislation passed by the Congress on June 28, 1958 calling for a national inventory of the outdoor recreation resource. Also, recommendations are to be made with the purpose of pointing out recreational needs at two future dates—1976 and 2000. As a large share of the outdoor recreational opportunities is on forest land, this inventory takes on real significance for the forestry profession.

The inventory of recreational opportunities will be the first ever made on a national basis. As the job is in its formative stages, the whole operation, except for the end product, is pretty much unpredictable at this time. It is certain, however, that strong participation and guidance by foresters is indicated throughout the entire project. Particularly are foresters going to be interested in predictions of future needs.

The Act (P. L. 85-470) authorizing this project calls for creation of a 15 member Commission to guide the undertaking. This Commission has been appointed—eight members of the Congress and seven citizen members. Two of the citizen members are foresters. At an early date, a 25 member advisory group is to be appointed to work with the Commission. Also, an executive

secretary will be appointed and a staff will be required. The job is to be done by September 1, 1961.

As this project proceeds there will be individual foresters in active participation. It is paramount, however, that the profession as a whole assert its interest and express pertinent and constructive judgments as appropriate.

To achieve professional participation it is desirable that forestry literature carry current accounts of progress. Foresters should study these reports and be prepared to discuss and comment on trends and conclusions. Forestry meetings should provide for current reports on developments and devote time to critical analysis. If well-thought-out recommendations result from these analytical reviews, steps must be taken to see that they are transmitted to individuals or groups actively participating in guiding the inventory and in developing recommendations.

The two foresters who are members of the commission can be expected to represent us well and they have the full confidence of the profession. They cannot, however, be expected to know the judgment of the profession unless we so inform them. Obviously, individual judgments of everyone cannot be transmitted. Arrangements must be made, therefore, to develop collective opinions—well thought out and concisely reported. Section meetings and other similar groups can serve as forums with committees to formulate opinions and place them where they will receive attention. An early meeting of each Section should devote time to discussion of this project. Subsequent meetings should follow up.

This project does not carry any sinister or negative implications for foresters. Quite to the contrary, it will be a positive, constructive collection of information which will provide a basis for recreation policy and judgment for many years. Because much outdoor recreation is on forest land the forthcoming recommendations, policies, and judgments have strong forestry implications. Therefore, the forestry profession should make it a point to be a real part of this effort and to participate forcefully and constructively. We shall have no one to blame if we neglect our professional responsibilities in this area.

CHAS A. CONNAUGHTON

D. C. Section All-Day Meeting

"The Status of the Forestry Profession in the U. S." will be one of the vital topics to be discussed in an all-day meeting sponsored by the Washington Section of the Society on February 19, 1959.

Mr. D. E. Hess, vice president and general manager of the Glatfelter Pulpwood Company, Gettysburg, Pa., will moderate a panel of federal, state, and consulting foresters and will deliver the principal paper on the subject "Current Problems in Government—Industry Relations in the East."

A panel considering "Trends in Forest Inventory Systems" will be led by Richard C. Wilson, chief of the Forest Survey Branch, U.S.F.S., Washington, D. C.

A third panel, moderated by James B. Craig, editor of *American Forests* magazine, will discuss "The Use of Chemicals in Forest Management."

A luncheon will be highlighted with an address by Arthur Nelson, Jr., manager of the Forest Products Division of Champion Paper and Fiber Co., Hamilton, Ohio.

Visiting Society members and members of near-by Sections are cordially invited to attend and participate in this meeting which will begin at 9:00 AM at the Presidential Arms, 1320 G Street NW, Washington, D. C.

Appalachian Officers Elected

Results of the election of officers of the Appalachian Station for 1959 have been announced.

The new officers are: chairman, Walter T. Ahearn, Columbia, S. C.; vice chairman, Robert M. Osborn, Franklin, Va.; secretary-treasurer, Norbert B. Goebel, Clemson, S. C.; and member of the executive committee, L. E. Chaiken, Durham, N. C. H. F. Lathrop, immediate past chairman, will serve as the fifth member of the executive committee.

All are elected for a one year term with the exception of the secretary-treasurer, who will serve two years. They will take office February 7.

Little Beaver
Tree Girdler

The Machine That Gets Production In Any TSI Operation

The LITTLE BEAVER TREE GIRDLER — girdlers all trees regardless of shape, size or species. SPEED — allow one second per diameter inch. Trees 4 to 6 inches in diameter are girdled in less than 5 seconds—30 inch tree—30 seconds. To get production the practical, economial way—use the LITTLE BEAVER TREE GIRDLER a machine designed to do the job.

Get The Complete Job Done With The Little Beaver

For Full Details See Your Dealer or Write

HAYNES Mfg. Co. LIVINGSTON TEXAS

TREES FOR FOREST PLANTING
PINE·SPRUCE
We have grown Pine, Spruce and other conifers for 50 years.
KEENE FORESTRY ASSOCIATION
BOX 378, KEENE, NEW HAMPSHIRE

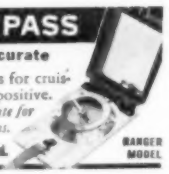
PANAMA
Equipment for Foresters

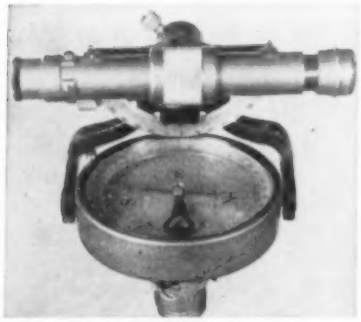
- B. B. Fan Drive Pumps
- B. B. Slip-on Units
- Skid Mounted Units
  Pump, Engine, Tank, Completing Materials, All on Steel Skids
- Compensating By-passes
- High Pressure Hose
- Pistol Grip Cut-offs
- Combination Nozzles
- Vacuum Lift Systems
- Automatic Float Valves
- Tree Marking Guns
  Pressure Type
- Tree Injectors
  Pressure Type
- *Stainless Steel* Drip Torches
- Flame Guns
- Basal Area Angle Gauges

Write For Free Catalog
PANAMA PUMP CO.
P.O. Box 689
Hattiesburg, Mississippi

EVERGREEN
Seedlings and Transplants
LARGE or SMALL QUANTITIES
First grade lining-out stock . . . from finest seed source available . . . grown at our own nursery. Assure top survival for reforestation, soil erosion, water shed or Christmas Tree planting. Widest practical range in sizes and varieties of Pine, Spruce, Fir, Hemlock, etc.
Free Wholesale Price List
SUNCREST NURSERIES
BOX 305-GG HOMER CITY, PA.

PACIFIC WEATHER SERVICE
WEATHER: Forecasts—Warnings—Modification.
Fire Danger Rating—Instruments
J. B. "Ben" Melin, Meteorologist
1222 N.E. 117th Ave., Portland 20, Oregon
AL. 2-5410

SILVA COMPASS
Simpler — More Accurate
Recommended by foresters for cruising. Easier to use, faster, positive. Direct course readings. *Write for free literature and instructions.*
SILVA, INC., Dept. M, La Porte, Ind.

RANGER MODEL



SURVEYOR'S COMPASS WITH TELESCOPE

This sturdy, durable instrument possesses many new and important features that make it far superior to any other survey compass. It is unusually compact and light, weighing only four pounds including the tripod. The seven-power telescope is equipped with cross hairs and stadia hairs. The diameter of the compass is 3¾ inches and that of the verticle half circle is 3¼ inches. The compass card is graduated in quadrants, and the vertical scale is graduated in degrees and per cent of slope. The tripod extends from 27" to 47".

Compass, tripod, carrying case and plumb bob sell for $75.00 f.o.b. Bennington, Vermont.

FRED STEWART ASSOCIATES
BOX #44, BENNINGTON, VT.

WILLIAM E. REIFSNYDER

Reifsnyder Appointed Associate Editor for Forest Fire

William E. Reifsnyder, associate professor of forest meteorology of the Yale School of Forestry, has been appointed by President Garratt as JOURNAL OF FORESTRY associate editor for Forest Fire. He assumed this post as of January 1, 1959, succeeding Keith Arnold, who had asked to be relieved because of the press of other duties.

Reifsnyder received a B.S. degree in meteorology from New York University in 1944 after attending the New York College of Forestry, 1941-43. He received his M.F. from the University of California in 1949 and a Ph.D. from Yale University in 1954. He assumed his present post in January 1955 after having served as meteorologist of the California Forest and Range Experiment Station during 1952-54. In February 1958 he was instructor in meteorology at the U. S. Forest Service National Fire Behavior Training Course, Missoula, Mont. From 1944 through 1946 he was a weather-electronics officer, U. S. Army Air Forces.

Northern California Section Holds Winter Meeting

Having as its theme "Forestry as a Business" the Northern California Section's meeting of December 6 in San Francisco featured a hypothetical stockholders' discussion concerning the affairs of the mythical "S. A. F. Timber Company." Each of the 300 members present was assumed to be a stockhold-

PRUNING MADE EASY

Bartlett Mfg. Co. now offers the M-414 MEYLAN PRUNING SAW which consists of the use of an axe handle with the Bartlett No. 44 Pole Saw Head except that a special blade of heavier tool steel is used and can be furnished in either 16" or 18" length. The axe handle, which is especially made for this saw is properly tapered to fit the head and is 36" long.

Because the Meylan Saw will enable a man of average height to prune 9½ ft. from the ground, it has made a saving in pruning coniferous plantations as great as 25%.

The Saws are available for prompt shipment, delivered to any address in U.S.A. at the following prices.

M-414 Meylan Saw, complete with 16" blade.....$12.00

M-414 Meylan Saw, complete with 18" blade.....$12.50

Subject to special price to public institutions for dozen lots.

BARTLETT No. 114B PRUNING SAW

Streamlined, speedy-cutting pruning saw with big, husky teeth that cut full length of blade. No other saw compares with it for speed, efficiency and ease of filing. No special gauges required.

114B—Special Utility Saw Delivered $9.10

Bartlett Mfg. Co.
3019 E. Grand Boulevard
Detroit 2, Mich.

er. A 15-minute question period followed the report of each officer.

Reports on profits were given by Joseph E. Shipsey of Diamond Gardner Corp.; on insurance by Jack B. Wright of Marsh & McLennan Company; on reforestation of the company's idle lands by Burnett H. Payne of the U. S. Forest Service; on the economic worth of the company's timber by John A. Zivnuska of the University of California; and on research and developments by Byrne C. Manson of Simpson Redwood Company. The question and answer periods were spirited and searching.

Chairman Harry C. Abraham presided at the Section's business sessions, at which committee reports were received.

At the Section's evening dinner Harvey Striplin served as master of ceremonies. DeWitt Nelson, former SAF president, introduced George A. Garratt, current president, who gave the principal address of the evening, "Conflicts in Land Use."

A summer field meeting of the Section will be held June 5 and 6 in the Santa Cruz area.

Division of Range Management Officers Announced

Candidates for officers of the Division of Range Management were nominated at the annual meeting in Salt Lake City last autumn and the Division has subsequently held a mail ballot. New officers are as follows:

Chairman—Joseph Wagner, Bureau of Indian Affairs, Washington, D. C.

Vice chairman—Reginald M. DeNio, U. S. Forest Service, San Francisco, Calif.

Secretary—Lowell K. Halls, Southern Forest and Range Experiment Station, New Orleans, La.

Coming Events

Appalachian Section

The Appalachian Section meets February 6-7 in the Wade Hampton Hotel, Columbia, S. C.

Allegheny Section

The Allegheny Section holds its winter meeting February 12-14 in the Warwick Hotel, Philadelphia, Pa.

Winter Meeting of D.C. Section

On February 19, the D. C. Section will hold a full-day formal winter meeting. See page 141.

Central Rocky Mountain Section

The Central Rocky Mountain Section will meet in Fort Collins, Colo., February 20-21.

Ozark Section

On February 20-21 Ozark Section members will meet at the Connor Hotel, Joplin, Mo.

Southern California Section

The spring meeting of the Southern California Section will be held on April 10 and 11, with headquarters in San Diego.

Columbia River Section

The spring meeting of the Columbia River Section will be held on April 18 at Eugene, Ore.

Gulf States Section

Plans have been made for the annual meeting of the Gulf States Section to be held May 7-8, in Tyler, Texas.

Northern California Section

A field meeting of the Northern California Section will be held on June 5 and 6 in the Santa Cruz area.

Lake States Forest Tree Improvement Conference

The Fourth Lake States Forest Tree Improvement Conference has been scheduled for October 6 and 7, at the University of Michigan, Ann Arbor.

CHRISTMAS TREE SEEDLINGS—of the best quality,—grow trees for Profit, Conservation, Beauty and Recreation. Scotch pine from our own blue-green handpicked seed, selected for best Christmas tree qualities. Write for Catalog of wide selction of seedlings, transplants, and ornamental evergreens.

PAINT CREEK NURSERIES
Shippenville, Pa.

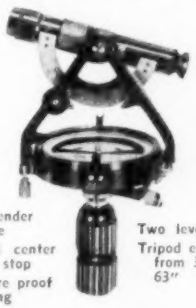
Another
BEN MEADOWS
Exclusive

FORESTERS—Here is a new telescope compass that will save you time and money. Work your boundary and cruise lines with greater ease and more accuracy.

3-IN-1 SURVEYING COMPASS, TRANSIT & LEVEL

10 power telescope—erect image—stadia hairs. Used since 1921. Vertical scale in degree. Compass graduated in quadrants and to half degrees. Complete with leather case, tripod & plumb bob.

Priced at only $75.00 (Order No. 28)



Flat slender needle
Jewelled center and stop
Moisture proof housing
Two level vials
Tripod extends from 36" to 63"

IMPROVED MODEL with declination device and percent and degree on vertical circle. Complete with case, tripod & plumb bob.

NO. 28-1 ..... $98.50

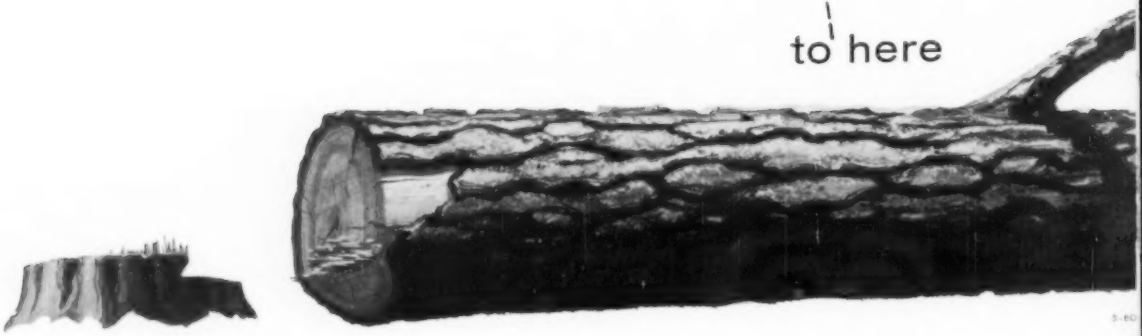
REVERSIBLE TELESCOPE for convenient back-sight, declination device, percent and degree on vertical scale. 5 MINUTE VERNIER. Complete with leather case, tripod & plumb bob.

NO. 25-1 ..... $149.95

The
BEN MEADOWS
Co.
Phone: CEdar 3-2601
315 PHARR ROAD, N.E.
ATLANTA 5, Georgia

From here

to here



less effort with McCULLOCH

McCulloch Corporation, Los Angeles, California • Marine Products Division, Minneapolis, Minnesota • McCulloch of Canada, Ltd., Toronto, Ontar

The New McCulloch Line

MORE VALUE, MORE FEATURES THAN EVER

(and priced as low as $149.95)

The '59 McCullochs—the most complete line in chain saw history—offer you more new and exclusive features than ever before.

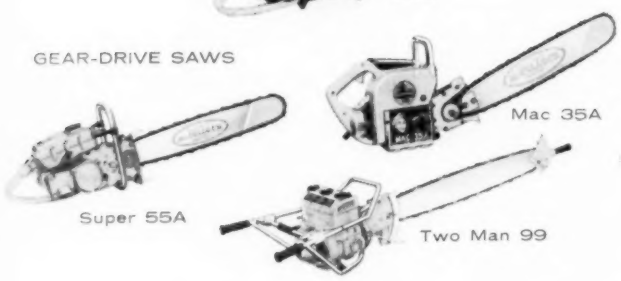
There's the exclusive new McCulloch muffler that deadens engine "bark." It's on the Super 55A and 44A—new saws that give you more power for big cutting jobs.

The powerful D36 and low-priced Mac D30 (only $149.95) have McCulloch's exclusive new centerline starting. It makes starting easier, faster, distributes weight more evenly. The D36 and Mac D30 feature LUBRI-MAC oiling—another McCulloch exclusive. Eliminates need for a separate oil tank. And light weight is still another value feature of those new saws—only 17 pounds. You also get light weight in the new Mac 35A. It's the lightest gear-drive saw made—only 19 pounds. And what lugging power!

Those are only a few of the new features that make the '59 McCullochs the biggest value ever in professional-quality chain saws. See your McCulloch dealer for a free demonstration. For complete literature and prices, write: McCulloch Corporation, Los Angeles 45, California.

DIRECT-DRIVE SAWS

GEAR-DRIVE SAWS



"You're in luck when you've got a McCulloch chain saw"

CHAIN SAWS

5-8002

Southern California Section Holds Winter Meeting

Despite serious forest fire conditions in southern California which limited attendance, the Southern California Section held a successful meeting in Pasadena on December 5 and 6.

At the business session Chairman Lynn R. Biddison presided. Following committee reports, Henry Clepper, executive secretary, discussed Society affairs.

"Air Operations in Fire Control" was the theme of the technical session. Among the speakers were Nolan O'Neal of the U. S. Forest Service, Jack Burke of the California Division of Forestry, and Jay Peterson of the Angeles National Forest. Spectacular motion pictures of air attacks on forest fires were shown.

At the Section's dinner, held in the Green Hotel, 60 members and guests were present.

On the morning of the second day, the members assembled at the Chino airport to witness a display of "drop" airplanes and their equipment, an exhibit of borate mixing operations, and another of "helitack" gear.

The Section's spring meeting is scheduled to be held April 10 and 11 at San Diego.

Membership Applications and Advancements

Proposals for admission, advancement, and reinstatement received in the Society office during the month of December are listed below.

Action on the eligibility of those proposed for membership as listed below will be taken by the Council as of March 1959.

Communications from the voting members regarding the membership eligibility of these persons should be received in the Society office prior to that date.

Alsup, J. S., R. F. D. Rt. 3, Athens, Ga. (St. 58; Jr., **Southeastern**).

Anderson, P. A., Tech. Sales, U. S. Plywood Corp., Levittown, N. Y. (Jr. 1952; Member, **New York**).

Arendys, C. L., 1510 Wilson, Des Moines, Iowa (St. 58; Jr., **Upper Miss. Valley**).

Barker, R. N., (St. **Utah State**).

Barnes, C. B., Asst. Dist. Forester, Dierks Forest Inc., DeQueen, Ark. (Affiliate, **Ozark**).

Bauer, C. H., Consulting Forester, Jamestown, N. Y. (Jr. 1952; Member, **New York**).

Belau, L. R., (St. **Mont. State**).

Bennett, J. W., Asst. Dist. Forester, Hiwassee Land Co., Gainesville, Ga. (Jr. 1952; Member, **Southeastern**).

Berger, J. M., 116 Pierpont, Dunlap, Iowa (St. 58; Jr., **Upper Miss. Valley**).
Blanford, R. H., Tech. Forester, Calif. Div. of Forestry, Riverside, Calif. (Jr. 1952; Member, **Southern Calif.**).
Blomquist, C. R., Star Rt., Box 184, Iron Mountain, Mich. (St. 57; Jr., **Wis.-Mich.**).
Bossier, C. A., Unit Forester, International Paper Co., Woodville, Texas (Jr. 1952; Member, **Gulf States**).
Bowers, J. W., Unit Forester, International Paper Co., Sheridan, Ark. (Affiliate 1955; Jr., **Ozark**).
Breard, L. B., Wood Procurement, International Paper Co., Bastrop, La. (Jr. 1952; Member, **Gulf States**).
Bright, D. E., Entom. Asst., Univ. of Utah, Dugway, Utah (Associate, **Intermountain**).
Brooks, E. R., (St. **Univ. Mass.**).
Brown, B. A., Asst. Prof., Univ. of Minn., Cloquet, Minn. (Jr. 1952; Member, **Upper Miss. Valley**).
Builteman, O. J., Unit Forester, International Paper Co., Henderson, Texas (Jr. 1952; Member, **Gulf States**).
Burroughs, I. C., Chief Forester, E. Tenn. Iron & Coal Co., Jacksboro, Tenn. (Rein. Member, **Ky.-Tenn.**).
Busch, W. H., Wood Preserving Sales, International Paper Co., Overland Park, Kan. (Jr. 1952; Member, **Ozark**).
Campbell, D. C., Dist. Forester, Iowa Cons. Comm., Farmington, Iowa (Jr. 1952; Member, **Upper Miss. Valley**).
Campbell, R. L., Tech. Control Forester, Rome Kraft Co., Rome, Ga. (Jr. 1952; Member, **Southeastern**).
Carey, S. C., Asst. Mill Mgr., U. S. Indian Service, Redby, Minn. (Jr. 1952; Member, **Upper Miss. Valley**).
Carroll, R. L., Unit Forester, International Paper Co., Pine Grove, La. (Jr. 1952; Member, **Gulf States**).
Carter, V. E., Chief Forester, Container Corp. of America, Brewton, Ala. (Jr. 1952; Member, **Southeastern**).
Cates, R. G., (St. **Mont. State**).
Chehock, C. R., (St. **Mont. State**).
Christianson, R. D., (St. **Mont. State**).
Coleman, J. H., Asst. Ranger, USFS, Moncks Corner, S. C. (Jr. 1952; Member, **Appalachian**).
Conine, G. P., Forester, Lassen Natl. Forest, Susanville, Calif. (Junior, **Nor. Calif.**).
Connor, R. C., Forester, W. C. Bradley Co., Columbus, Ga. (Jr. 1952; Member, **Southeastern**).
Coon, J. D., (St. **Iowa State**).
Cooper, J. S., Chief Forester, The Flintkote Co., Meridian, Miss. (Jr. 1952; Member, **Gulf States**).
Corbett, E. S., (St. **N.Y. State**).
Coufal, J. E., (St. **N.Y. State**).
Craul, P. J., Asst. Forester, Pa. Dept. of Forests & Waters, Renovo, Pa. (Jr. 1954; Member, **Allegheny**).
Crown, W. L., Asst. Mgr., Owens-Ill. Glass Co., Valdosta, Ga. (Jr. 1952; Member, **Southeastern**).
Cukurs, P., 2916 E. 24th St., Minneapolis, Minn. (St. 57; Jr., **Upper Miss. Valley**).
Dannenberg, W. W., Woods Dept. Supt., U. S. Gypsum Co., Greenville, Miss. (Jr. 1952; Member, **Gulf States**).
Davidson, R. R., 1811 So. 73 St., West Allis, Wis. (St. 55; Jr., **Wis.-Mich.**).
Day, A. C., (St. **Mont. State**).
Devereaux, T. L., Box 477, Campus P.O., Athens, Ga. (St. 57; Jr., **Southeastern**).
Dieterich, J. H., Research Forester, USFS, Missoula, Mont. (Jr. 1952; Member, **No. Rocky Mountain**).
Dissmeyer, G. E., (St. **Mich. State**).
Dorward, R. E., Forester, Bowaters, Maryville, Tenn. (Jr. 1952; Member, **Ky.-Tenn.**).
Dunson, C. C., (St. **Mich. State**).
Duran, G., Dist. Ranger, USFS, Tres Piedras, New Mexico (Jr. 1952; Member, **Southwestern**).
Egerman, K. J., (St. **Mont. State**).
Evans, T. C., Staff Asst., San Isabel Forest, Pueblo, Colo. (Jr. 1952; Member, **Central Rocky Mountain**).
Farley, D. L., Dist. Asst., USFS, Mazama, Wash. (Jr. 1952; Member, **Puget Sound**).
Fillmore, W. J., S. D. State Forestry Dept., Pierre, S. D. (Jr. 1952; Member, **Central Rocky Mountain**).
Finch, S. J., Asst. Chief of Timber Mgmt., Mont. State Forestry Dept., Kalispell, Mont. (Jr. 1955; Member, **No. Rocky Mountain**).
Finison, B. F., Dist. Ranger, USFS, Leesville, La. (Jr. 1954; Member, **Gulf States**).
Fisher, J. G., Tech. Asst., Ore. State Board of Forestry, Medford, Ore. (Junior, **Col. River**).
Ford, E. M., Forester, Crown Zellerbach Corp., Bogalusa, La. (Jr. 1952; Member, **Gulf States**).
Franklin, R. P., 3013 Lincoln Way, Ames, Iowa (St. 58; Jr., **Upper Miss. Valley**).
Freel, R. D., 207 Lynn Street, Ames, Iowa (St. 57; Jr., **Upper Miss. Valley**).
Friedrich, R. P., (St. **Pa. State**).
Gabriel, H. W., Forester, USFS, Ogden, Utah (Affiliate, **Intermountain**).
Garrett, H. R., Forester, USFS, Ripley, Miss. (Jr. 1952; Member, **Gulf States**).
Garrison, J. C., 381 So. Pope Street, Athens, Ga. (St. 57; Jr., **Southeastern**).
Gilbert, R. R., Forest Eng., Jones & Anderson Timber Co., Darrington, Wash. (Jr. 1952; Member, **Puget Sound**).
Glass, T. D., Forester, Union Bag-Camp Paper Corp., Glenwood, Ga. (Jr. 1952; Member, **Southeastern**).
Gorsh, J. W., (St. **Mont. State**).
Graves, B. J., Jr. Forester, Warland Ranger Sta., Libby, Mont. (Affiliate, **No. Rocky Mountain**).
Greenway, G. H., Forester, MacGregor Triangle Co., Boise, Idaho (Jr. 1955; Member, **Intermountain**).
Gresham, W. G., Unit Forester, International Paper Co., Heber Springs, Ark. (Affiliate, **Ozark**).
Grissom, H. S., Asst. Dist. Forester, Gulf States Paper Corp., Tuscaloosa, Ala. (Rein. Jr., **Southeastern**).

BETTER SURVIVAL,
BETTER GROWTH
WITH
ROOTSPRED
TREE PLANTERS

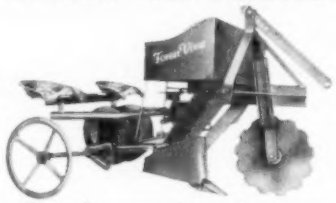
ROOTSPRED "Lake States". Scalper reduces competition 15" each side of planted tree.

- **For effective scalping — north or south, heavy soils, or light**
- **A deeper trench with soil loosened below root level**
- **A dependable satisfaction guarantee**
- **An economical model for Christmas Tree Growers**
- **Also a production plantation mower—double rotary**

For specifications, prices, photos, write:

ROOTSPRED
St. Petersburg, Pennsylvania

A
FORESTVIEW
TANDEM Tree PLANTER



- **Rugged, commercial steel construction throughout**
- **Correct planting depth on any terrain**
- **Plants seedlings, liners, potted material, etc. without damage**

Forestview's Tandem Planter gives you the most in exclusive "custom-built" advantages at regular prices. With Forestview you get adjustable planting depth lever . . . timing wheel that spaces evenly . . . scalloped coulter for easy cutting of briers, roots, etc. . . . special trencher shoe with slip-fit point . . . non-clogging stripper bar . . . and many others. Investigate the savings you can make with a Forestview Planter.

Write Today For Literature and Prices—FREE Dealer Inquiries Invited

Forest View
EVERGREEN NURSERY
DEPT. JF GERMANIA, PENNA.

Grothman, R. R., 19 W. Prospect Ave., Tomahawk, Wis. (St. 58; Jr., **Wis.-Mich.**).
Gruber, G. J., (St. **Mont. State**).
Guegold, F. F., Forester, Bowaters, Etowah, Tenn. (Jr. 1952; Member, **Ky.-Tenn.**).

Hammond, R. C., Safety Eng., Aetna Life Insurance Co., Duluth, Minn. (Jr. 1952; Member, **Upper Miss. Valley**).
Hardie, H. B., 316 Hayward Ave., Ames, Iowa (St. 57; Jr., **Upper Miss. Valley**).
Hartley, M. E., Tree Farm Forester, Scott Paper Co., Everett, Wash. (Jr. 1952; Member, **Puget Sound**).
Harvey, R. G., (St. **Ore. State**).
Haynes, J. D., Dist. Forester, Gulf States Paper Corp., Columbiana, Ala. (Jr. 1952; Member, **Southeastern**).
Hemerling, H. W., Asst. Ranger, Shoskone Forest, Cody, Wyo. (Jr. 1952; Member, **Central Rocky Mountain**).
Hendrickson, J. P., Forester, West Tacoma Newsprint Co., Tacoma, Wash. (Jr. 1952; Member, **Puget Sound**).
Hendrickx, L. A., (St. **Mont. State**).
Hill, H. L., Dist. Forest Supv., International Paper Co., Picayune, Miss. (Jr. 1952; Member, **Gulf States**).
Holzweissig, A. C., Cartographer, USFS, Missoula, Mont. (Jr. 1953; Member, **No. Rocky Mountain**).
Horsman, L. E., Forester, U. S. Army Eng. Adm., Slidell, La. (Jr. 1952; Member, **Gulf States**).
Hunt, E. R., Sr. Forester, Ore. State Board of Forestry, Forest Grove, Ore. (Jr., **Col. River**).
Hunt, E. V., Asst. Prof., Stephen F. Austin State College, Nacogdoches, Texas (Jr. 1952; Member, **Gulf States**).
Hunt, J. D., (St. **Idaho State**).
Hyatt, A. J., Dist. Forester, Ala. Dept. of Cons., Huntsville, Ala. (Jr. 1952; Member, **Southeastern**).

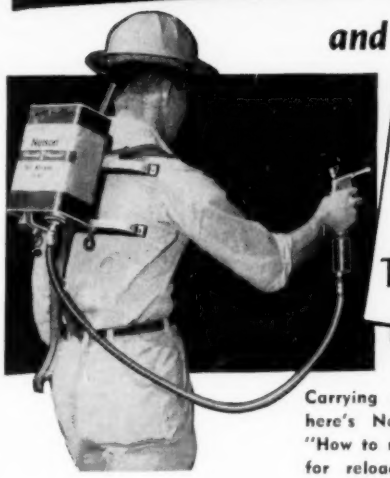
Jackson, F. L., Dist. Ranger, USFS, Tucson, Ariz. (Jr. 1952; Member, **Southwestern**).
Jackson, N. R., Fieldman, St. Regis Paper Co., McDonough, Ga. (Jr. 1952; Member, **Southeastern**).
Jarrard, S. E., Dist. Forester, Dierks Forests, Inc., Daisy, Ark. (Jr. 1952; Member, **Ozark**).
Jayne, J. L., 2020 Douglas, Ames, Iowa (St. 58, Jr., **Upper Miss. Valley**).
Jenkins, J. A., Inspector, Southwestern Lab., Houston, Texas (Jr. 1952; Member, **Gulf States**).
Jennings, B. B., Logging Eng., Southwestern Lumber Mills Inc., Flagstaff, Ariz. (Jr. 1952; Member, **Southwestern**).
Johnson, C. D., Field Rep., Scott Paper Co., Lucedale, Miss. (Jr. 1952; Member, **Gulf States**).
Johnson, C. G., Forest Mgmt. Forester, Dept. of Natural Resources, Olympia, Wash. (Junior, **Puget Sound**).
Johnson, R. H., (St. **Yale**).
Johnson, W. E., Dist, Ranger, USFS, Verlot, Wash. (Jr. 1952; Member, **Puget Sound**).

Kalkoske, G. A., (St. **Mont. State**).
Kapel, F. J., Staff Supv., Kootenai Natl. Forest, Libby, Mont. (Rein. Jr., **No. Rocky Mountain**).

NOW a Lighter 1-gal. BACK PACK

and Easier-operating

NEL-SPOT GUN for Large Scale Tree-Marking!



Carrying more paint but pounds *lighter*, here's Nelson's answer to the problem "How to mark more trees with fewer stops for reloads"—on plantations—other big operations.

NO HEAVY CONTAINER

Using the pumping action of its new easier-operating Nel-Spot Gun to pull paint through the hose, the Nel-Spot Back Pack requires no compressed air, no special container of heavy-gauge steel for the paint.

NO TEDIOUS PUMPING

Needing no pressure behind the paint, the Nel-Spot Back Pack eliminates pumping. Eliminates messy paint transfers too. A standard-size gallon paint can, just as it comes from the factory, *that* (and a more comfortable harness) is all there is to the Nel-Spot Back Pack.

AND REDUCES YOUR COST

The Nel-Spot Back Pack, using Nelson's specially formulated Tree Marking Paint offers these other positive economies

—time saved cleaning plugged guns—time saved stirring and transferring paint—no part-cans wasted—plus extra yield (more spots per gallon) and extreme durability (no remarking).

• • •

For ordinary day-to-day marking, of course, the Nel-Spot Quart Hand Gun—favorite tree marking tool for foresters all over the world—is still tops. (For latest improvements, see the new Model D-103).

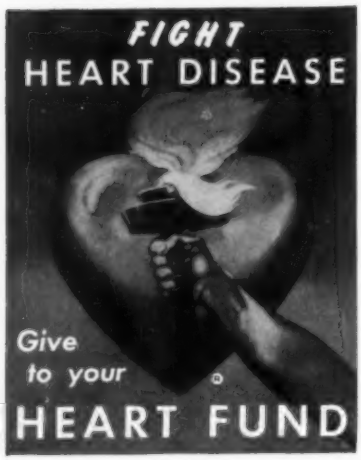
Order Now—or for more details—Write Dept. JF

THE NELSON COMPANY

Iron Mountain, Mich. (Box 349) Montgomery, Ala. (Box 1892)

Kent, H. D., (St. **Iowa State**).
Kiekbusch, W. L., Dist. Ranger, USFS, Van Buren, Mo. (Jr. 1952; Member, **Ozark**).
Kimery, P. H., (St. **Mont. State**).
Klebenow, D. A., (St. **Mont. State**).
Klemeyer, J. L., Sales Mgr., Klemeyer Lumber Co., Vincennes, Ind. (Rein. Jr., **Central States**).
Kreis, E. A., Voc. Forester, State Dept. Education Co., Decatur, Ga. (Jr. 1952; Member, **Southeastern**).
Kressback, J. N., Inspector, Western Electric Co., Inc., Cincinnati, Ohio (Junior, **Central States**).
Krier, J. P., Prof. of Forestry, Mont. State Univ., Missoula, Mont. (Jr. 1952; Member, **No. Rocky Mountain**).
Kullman, J. R., Dist. Forester, Mo. Cons. Comm., West Plains, Mo. (Jr. 1952; Member, **Ozark**).

La Due, F.M., Forester, St. Regis Paper Co., Carthage, N. Y. (Jr. 1952; Member, **New York**).
Laven, E. E., Forester, Roundtop Ranger Sta., Avery, Idaho (Junior, **Inland Empire**).
Lawrason, T. B., Forester, Terrelonne Lumber & Supply Co., Inc., St. Francisville, La. (Jr. 1952; Member, **Gulf States**).
Leach, M. S., Forestry & Range Officer, Bureau of Land Mgmt., Juneau, Alaska (Jr. 1953; Member, **Puget Sound**).
Livingston, G. K., (St. **Utah State**).



Livingston, G. M., Forester, Cyrene Turpentine Co., Bainbridge, Ga. (Jr. 1952; Member, **Southeastern**).
Logan, R. D., Mgmt. Forester, Miss. Forestry Comm., Rolling Fork, Miss. (Jr. 1954; Member, **Gulf States**).
Long, L. C., Mgmt. Forester, USFS, Gainesville, Ga. (Jr. 1952; Member, **Southeastern**).
Lott, F. J., Mgmt. Forester, Newton Wright & Hardin Lumber Co., Forsyth, Ga. (Jr. 1952; Member, **Southeastern**).
Love, L. D., Research Center Leader, USFS, Fort Collins, Colo. (Jr. 1952; Member, **Central Rocky Mountain**).

Manz, J. W., (St. **Mont. State**).
March, J. B., Forester, Bowaters, Etowah, Tenn. (Jr. 1952; Member, **Ky.-Tenn.**).
May, W. T., Supv., Bureau of Land Mgmt., Juneau, Alaska, (Jr. 1952; Member, **Puget Sound**).
McBride, J. R., (St. **Mont. State**).
McCartney, R. T., Timber Mgr., Wash. Plywood, Everett, Wash. (Jr. 1952; Member, **Puget Sound**).
McClain, L. E., Forestry Spec., Soil Cons. Service, Raton, N. M. (Junior, **Southwestern**).
McComb, C. R., 224 W. Shaw, East Lansing, Mich. (St. 56; Jr., **Wis.-Mich**).
McCullough, T. O., 1941 Div. St., Enumclaw, Wash. (St. 56; Jr., **Puget Sound**).
McMillan, A. M., 15 - 7th St., Pensacola, Fla. (St. 57; Jr., **Southeastern**).
Merrick, J. W., Forester, Bureau of Land Mgmt., Homer, Alaska (Jr. 1952; Member, **Puget Sound**).
Merritt, R. W., Forester, Union Bag-Camp Paper Corp., Homerville, Ga. (Jr. 1952; Member, **Southeastern**).
Meso, S. W., Graduate Student, Cornell Univ., Ithaca, N. Y. (Jr. 1952; Member, **New York**).
Minnich, H. F., Logging Eng., Biles-Coleman Lumber Co., Omak, Wash. (Jr. 1952; Member, **Puget Sound**).
Moak, J. E., School of Forestry, Miss. State College, State College, Miss. (Jr. 1952; Member, **Gulf States**).
Mohler, J. P., (St. **Mont. State**).
Moore, D. H., (St. **Idaho State**).
Murray, B. R., Ext. Forester, Univ. of Ga., Athens, Ga. (Jr. 1952; Member, **Southeastern**).

Nash, R. N., Forester, Smithfield Saw & Pulpwood Co., Smithfield, N. C. (Jr. 1952; Member, **Appalachian**).
Nelson, G. H., Forester, Custer Natl. Forest, Billings, Mont. (Jr. 1952; Member, **No. Rocky Mountain**).
Nichols, E. E., Asst. Dist. Ranger, USFS, Pasadena, Calif. (Jr. 1951; Member, **So. California**).
Nonnemacher, K., (St. **Mont. State**).
Noyd, L. C., (St. **Mont. State**).

Olson, S. E., Asst. Branch Forester, Weyerhaeuser Timber Co., Enumclaw, Wash. (Jr. 1952; Member, **Puget Sound**).
Oshima, E. M., (St. **Utah State**).

Paquin, R. H., (St. **Mont. State**).
Parlat, W.H., (St. **Mont. State**).
Patterson, J. R., Dist. Forester, Coosa River Newsprint Co., Childersburg, Ala. (Jr. 1952; Member, **Southeastern**).
Pearson, C. H., Prod. Mgr., Roseburg Lumber Co., Roseburg, Ore. (Rein. Member, **Col. River**).
Peroni, G. P., Instructor, Paul Smith's College, Paul Smiths, N. Y. (Jr. 1952; Member, **New York**).
Perry, J. L., Dist. Ranger, USFS, Pecos, N. M. (Jr. 1952; Member, **Southwestern**).
Pierce, J. R., Forest Entom., USFS, San Bernardino, Calif. (Jr. 1952; Member, **So. California**).
Pintado, S. A., Forestry Aid, USFS, Glenwood, Ark. (Affiliate, **Ozark**).
Pipkin, R. L., Forester, International Paper Co., Bay Minette, Ala. (Jr. 1952; Member, **Southeastern**).
Place, C. B., Asst. Dist. Forester, Ga. Forestry Comm., Rome, Ga. (Affiliate, **Southeastern**).
Preston, J. O., Forester, N. Y. State Cons. Dept., Jamestown, N. Y. (Jr. 1952; Member, **New York**).
Price, V. R., Forester, Prescott Natl. Forest, Prescott, Ariz. (Jr. 1952; Member, **Southwestern**).
Prouty, L. E., Plywood Dealer, International Paper Co., Monroeville, Ala. (Jr. 1952; Member, **Southeastern**).

Quinn, G. H., (St. **Mont. State**).

Reimer, R. D., (St. **Univ. Wash.**).
Renfro, J. F., Forester, Container Corp. of America, Brewton, Ala. (Jr. 1952; Member, **Southeastern**).
Richmond, H. L., Range & Forestry Position, Canon City, Colo. (Jr. 1952; Member, **Central Rocky Mountain**).

Binders For Journal of Forestry

Holds 12 issues of Journal

Brown imitation leather—stiff board—square corners lined.

Title *Journal of Forestry* stamped in gold foil on front cover and backbone.

Price $3, postpaid.

Order today

SOCIETY OF AMERICAN FORESTERS
Mills Building, Washington 6, D. C.

FREE CATALOG for the PROFESSIONAL FORESTER

A new dimension in forestry service . . .

96 PAGES FULLY ILLUSTRATED

Write today, for your free copy of Catalog No. 4. We ship within 24 hours of receipt of order—your money cheerfully refunded if not satisfied.

NASCO Fort Atkinson, Wisconsin
"Supplies and Equipment for the Professional"

CATERPILLAR'S PROJECT PAYDIRT

***PROJECT PAYDIRT** pays off for you*

NEW CAT D8 TRACTOR SERIES H

THE PAYOFF IN SITE PREPARATION: PRODUCTION UP—OPERATING COSTS DOWN!

GROUND CLEARANCE NOW 19⅞"—an increase of 50%.

HORSEPOWER INCREASED 18%—up to 225 from 191 (flywheel).

SIZE INCREASED—weight up approximately 4,400 lb. to 47,000 lb., gauge widened to 84 inches.

LIFETIME-LUBRICATED ROLLERS AND IDLERS—never need further lubrication until rebuilding.

DEPENDABLE OIL CLUTCH—key retained feature for direct drive; practically eliminates clutch down time.

DRY-TYPE AIR CLEANER—removes 99.8% of dirt in intake air even under severe operating conditions.

NEW, STRONGER, HEAVIER UNDERCARRIAGE—every component stronger through improved materials and heat treat processes.

BETTER VISIBILITY—new seat placement, location of console-type controls increases operator efficiency.

DRAWBAR HORSEPOWER—up to 180 from 155.

GREATER STABILITY—with 5,505 square inches of track on ground.

SIX DIRECTLY REVERSING SPEEDS—high forward is 6.3 MPH, reverse is 6.4 MPH (direct drive).

The new Caterpillar D8 Series H Tractor is ready *now* to increase its lead as undisputed king in its size class for forest site preparation. Whatever the job, from land clearing through harrowing, it now has the capacity to set new standards of production in the field.

The D8 Series H is new in design, appearance and performance. It is bigger, more powerful. It incorporates dramatic new engineering advances. It is easier to operate. And *more economical* to own.

Get the full story from your Caterpillar Dealer. Then *see* this great new machine at work on your job. You can't afford not to!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR

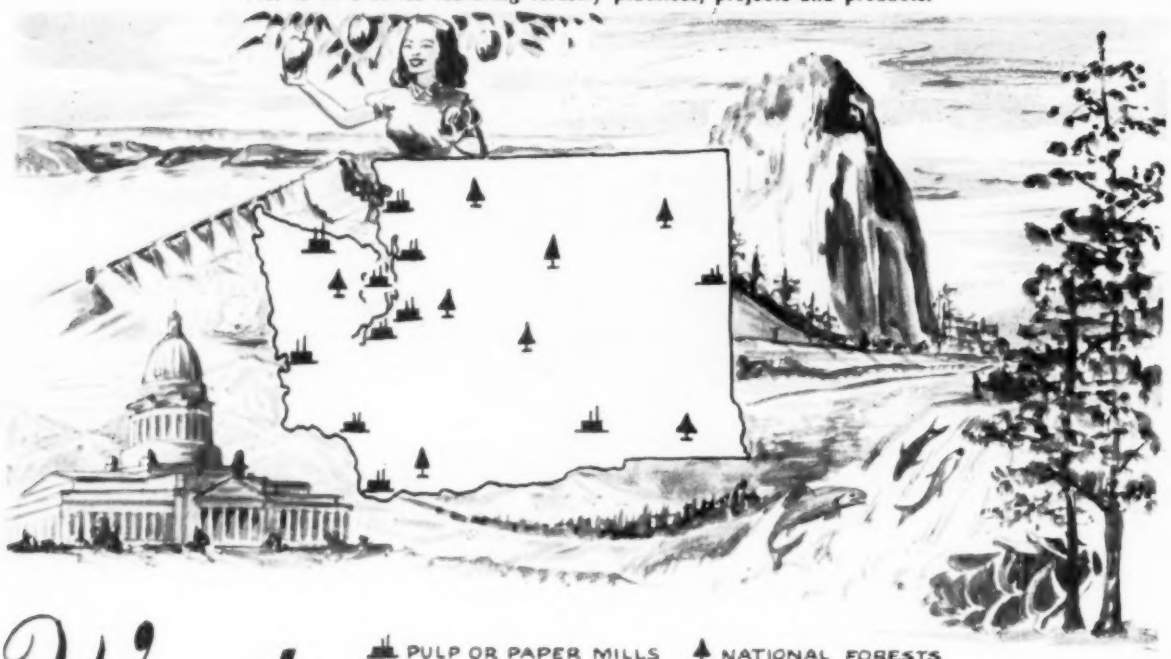
Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

CATERPILLAR'S PROJECT PAYDIRT

PROJECT PAYDIRT: Caterpillar's multi-million-dollar research program — to meet the continuing challenge of the greatest construction era in history with the most productive machines ever built.

BORN IN RESEARCH...
TESTED IN THE FIELD

No. 45 of a series featuring forestry practices, projects and products.



PULP OR PAPER MILLS NATIONAL FORESTS

Washington

With approximately 20 million acres of commercial forests, Washington is truly the Evergreen State. Forests are both a major scenic attraction and an economic mainstay.

More than half of the state's manufacturing dollars are derived from wood. Each year, the state harvests between 4 and 5 billion board feet of timber which is converted to forest products valued at more than 800 million dollars yearly. The official state tree, the Western Hemlock, and top-ranking Douglas fir are the top commercial species.

Next to the federal government, the State is the biggest single forest land owner, with some 2 million acres of timber. Much of this rich resource was granted by the federal government to help the state support its public schools.

The new Washington State Department of Natural Resources formed in March of 1957 consolidates all state agencies and functions which had jurisdiction over state lands. Under the leadership of State Land Commissioner Bert Cole, a former educator and logging operator, the Department has made great gains in management and protection of state-owned timber resources during its less-than-two years of existence. For the first time, the State can apply scientific and businesslike management methods to its forest lands.

Reforestation of cut or burned over lands not tended by Nature is a top priority program. This involves both direct seedling, including the use of helicopters to broadcast the seed, and direct planting of seedlings by hand or machine.

A modern new forest nursery has increased Department nursery production from 5 million 2-year-old trees two years ago, to 22,700,000 in 1958-59. Seedlings not used by state-owned lands are available at cost for federal and private lands.

With some of the best timber land in the state included in approximately 3⅓ million acres divided into 46,500 private ownerships of 500 acres or less, the Department cooperates actively to promote good management on these lands. Ten farm foresters cover 16 of the state's 34 timbered counties in a program financed jointly by the Department and the United States Forest Service. Farm foresters serve forest owners without charge in much the same way that extension agents serve farm land owners. Each year, more than 60,000 acres of forest land, representing nearly 1,000 owners, is placed under intensive management.

The Department also provides fire protection to 12¼ million acres of public and private forest land, valued in excess of 9 million dollars. In 1957, its fire suppression forces scored an all time record, holding fire loss to only 600 acres in a total of 752 fires. This average of less than eight-tenths acres per fire, is an all time low.

In addition, the Dept. of Natural Resources cooperates with the State Dept. of Institutions to administer two adult honor camps housing carefully selected inmates from the state penitentiary and reformatory. Inmates, supervisored by forestry foremen, perform forest rehabilitation and access road construction. Proving themselves also as outstanding fire suppression crewmen, they served some 3,000 man-days combating fires throughout the state during the severe 1958 fire season.

DEPARTMENT OF NATURAL RESOURCES—*contribution to this series does not necessarily constitute endorsement of Southern Glo products.*

How do you mark trees for cutting?—for seed?—for growth study? When you need durability and economy, we invite you to use SOUTHERN GLO tree marking paste. Perhaps the swiftest of all marking methods, SOUTHERN GLO offers added savings in paste based on the stay-mixed formula #71020. You mix faster—get more paint—more actual marks—per gallon than from any other paste tested. And SOUTHERN GLO does not "settle out" or clog your paint gun. Bright, clean SOUTHERN GLO colors remain visible year after year;—resist even extreme weathering conditions. If your dealer cannot supply you, order direct.

SOUTHERN COATINGS AND CHEMICAL CO. Dept. 2, Sumter, South Carolina—New Orleans, La.

Robillard, W. G., Forester, USFS, Laurel, Miss. (Jr. 1952; Member, **Gulf States**).
Robinson, R. F., Unit Forester, International Paper Co., Alto, Texas (Jr. 1954; Member, **Gulf States**).
Rogers, D. D., 1710 Orange St., Muscatine, Iowa (St. 58; Jr., **Upper Miss. Valley**).
Rolfson, V. P., (St. **Utah State**).
Ruffin, W. C., Forester, Mitchell Land, Florien, La. (Jr. 1954; Member, **Gulf States**).
Rus, W. E., 207 Lynn, Ames, Iowa (St. 57; Jr., **Upper Miss. Valley**).
Russell, D. L., 12620 1st So., Seattle, Wash. (St. 56; Jr., **Puget Sound**).

Sahlin, K. W., Dist. Forest Ranger, Coronado Natl. Forest, Safford, Ariz. (Jr. 1952; Member, **Southwestern**).
Sandifer, T. A., 901 E. Broad St., Athens, Ga. (St. 57; Jr., **Southeastern**).
Saylor, R. J., (St. **Mont. State**).
Schmidt, W. C., #13 Fergus, Missoula, Mont. (St. 58; Jr., **No. Rocky Mountain**).
Sebesta, E. C., Forester, USFS, Danville, Ark. (Affiliate, **Ozark**).
Seneff, G. A., Asst. Ranger, Rollinsville Ranger Sta., Rollinsville, Colo. (Jr. 1952; Member, **Central Rocky Mountain**).
Shenkyr, D. W., Forester, USFS, Lufkin, Texas (Jr. 1952; Member, **Gulf States**).
Shimer, R. J., Staff Forester, Alaska Dept. of Lands, Lockport, N. Y. (Jr. 1952; Member, **New York**).
Shipe, T. C., (St. **Mont. State**).
Shoemaker, L. R., Asst. Dist. Forester, Ky. Div. of Forestry, Somerset, Ky. (Affiliate, **Ky.-Tenn**).
Simpson, H. W., 3004 West St., Ames, Iowa (St. 56; Jr., **Upper Miss. Valley**).
Skabelund, P. H., (St. **Utah State**).
Skipper, H. A., 340½ Hampton Court, Athens, Ga. (St. 57; Jr., **Southeastern**).
Smith, C. E., (St. **Mont. State**).
Smith, C. L., 2406 E. 60th St., Seattle, Wash. (St. 58; Jr., **Puget Sound**).
Smith, W. A., Forestry Educator, Texas Forest Service, College Station, Texas (Jr. 1952; Member, **Gulf States**).
Snow, E. A., Staff Forester, Tenn. Valley Authority, Norris, Tenn. (Affiliate 1955; Jr., **Ky.-Tenn**).
Snyder, W. C., Dist Forester, Southland Paper Mills, Zachary, La. (Jr. 1952; Member, **Gulf States**).
Spaulding, D. W., Supv. Woods Operations, Western Maine Dead River Co., Bangor, Maine (Affiliate, **New England**).
Spears, J. D., 507 Sanders St., Auburn, Ala. (St. 57; Jr., **Southeastern**).
Sposta, J. W., Forester, Caribbean Natl. Forest, Rio Piedras, Puerto Rico (Affiliate 1953; Jr., **Southeastern**).
Sprenger, G. E., Forester, Kingsford Co., Parson, W. Va. (Jr. 1952; Member, **Allegheny**).
Steger, P. J., Inspector, Western Electric Co., Houston, Texas (Jr. 1952; Member, **Gulf States**).
Steiner, J. P., Forester, Bureau of Indian Affairs, Maverick, Ariz. (Jr. 1952; Member, **Southwestern**).
Stonex, R. G., 118 Woodlawn, Lansing, Mich. (St. 57; Jr., **Wis.-Mich.**).
Strickland, R. K., (St. **Univ. Georgia**).
Svenson, R. K., (St. **Mont. State**).
Swetnam, F. R., Dist. Forest Ranger, Carson Natl. Forest, Penasco, N. M. (Jr. 1952; Member, **Southwestern**).
Switzer, H. D., 524 N. Homer St., Lansing, Mich. (St. 56; Jr., **Wis.-Mich**).
Sylvester, V. E., Dist. Forest Ranger, USFS, Wise River, Mont. (Junior, **No. Rocky Mountain**).
Thompson, W. N., Pres., Hazlehurst Lumber Co., Inc., Hazlehurst, Ga. (Jr. 1952; Member, **Southeastern**).
Threlkeld, D. L., (St. **Mont. State**).
Thrower, R. L., Forester, Corbin Plywood & Timber Co., Opelika, Ala. (Jr. 1952; Member, **Southeastern**).
Tierson, W. C., Forest Gen. Foreman, Huntington Wildlife Forest, Newcomb, N. Y. (Jr. 1952; Member, **New York**).
Tompkins, G. L., Iowa State College, Friley Hall, Ames, Iowa (St. 58; Jr., **Upper Miss. Valley**).
Tromsness, H. I., Timber & Mfg. (Private), Steamboat Springs, Colo. (Jr. 1952; Member, **Central Rocky Mountain**).

Wagar, J. A., Asst. to Center Leader, Bloch Hills Research Center, Rapid City, S. D. (Jr. 1952; Member, **Central Rocky Mountain**).
Walker, G. D., Ext. Forester, Ga. Agric. Ext. Service, Athens, Ga. (Jr. 1952; Member, **Southeastern**).
Walker, L. B., Plywood Dealer, Columbiana, Ala. (Jr. 1952; Member, **Southeastern**).
Walker, W. D., Forester, USFS, Gloster, Miss. (Affiliate, **Gulf States**).
Ward, J. T., Dist. Forester, The Crossett Co., Hamburg, Ark. (Jr. 1952; Member, **Ozark**).
Warder, B. J., Dist. Forester, W. Va. Cons. Comm., Romney, W. Va. (Jr. 1952; Member, **Allegheny**).
Warner, J. R., Forest Economist, Lake States Forest Expt. Sta., St. Paul, Minn. (Jr. 1952; Member, **Upper Miss. Valley**).
Warren, B. J., P. O. Box 374, Athens, Ga. (St. 57; Jr., **Southeastern**).
Waterman, C. J., Asst. Ranger, Lolo Natl. Forest, Thompson Falls, Mont. (Jr. 1952; Member, **No. Rocky Mountain**).
Waters, J. W., Dist. Forest Ranger, Coronado Natl. Forest, Tucson, Ariz. (Jr. 1952; Member, **Southwestern**).
Watt, R. M., 3617 Bore St., Metairie, La. (St. 56; Jr., **Gulf States**).
Weber, F. P., (St. **Univ. Minn.**).
Weinheimer, A. J., Consulting Forester, Old Chatham, N. Y. (Jr. 1952; Member, **New York**).
Welsh, J. L., 5234 Univ. Way, Seattle, Wash. (St. 56; Jr., **Puget Sound**).
Williams, W. D., Unit Forester, International Paper Co., Conway, S. C. (Rein. Jr., **Appalachian**).
Wills, D. E., Asst. Dist. Forester, Dept. of Forests & Waters, Coudersport, Pa. (Jr. 1955; Member, **Allegheny**).
Wilson, C. N., Forester, USFS, Ketchikan, Alaska (Jr. 1952; Member, **Puget Sound**).
Wilson, J. L., 2780 East Grand River, East Lansing, Mich. (St. 57; Jr., **Wis.-Mich.**).
Witt, R. F., (St. **Mont. State**).
Wright, C. E., (St. **Mont. State**).
Wright, J. A., (St. **Iowa State**).

The complete, definitive . . .

FORESTRY HANDBOOK

Editor-in-Chief: **Reginald D. Forbes,** Consulting Forester; Staff Editor: **Arthur B. Meyer,** Editor, *Journal of Forestry*

In one volume—all the working methods, vital data of on-the-ground forestry as practiced today. Handbook organizes in workable form the essentials of forest management, silvics, silviculture, watershed management, and all other important related subjects. 23 indexed sections cover logging, fire prevention, forest insects and diseases, surveying, forest road engineering, etc. *"There is no other publication having so complete a coverage of practical data."* **Journal of Soil and Water Conservation.** Edited for the Society of American Foresters. 146 Contributing, Consulting Editors. *744 ills., tables; 1,201 pp.* *$15*

Essentials of Forestry Practice

Charles H. Stoddard

NEW! A practical textbook relating the purposes and working methods of applied forestry to the challenging problems of efficient and far-sighted forest management. All the important field practices and operations in timber growing, logging, forest protection, timber harvesting, and processing are described. Well-illustrated and mapped, and with 5 useful appendices, this book is designed for training students at the forest technician level. *99 ills., tables; 279 pp.* *$5.50*

The Physiology of Forest Trees

Edited by **Kenneth V. Thimann,** Harvard University; with 33 Contributors

This authoritative contribution to biological science is the result of the First International Symposium on Forest Tree Physiology. The papers of the participating scientists present research in nine major areas of investigation. Topics include the ascent of sap, aspects of translocation such as the movement of organic food materials, photo-synthesis, photoperiodic response, mineral nutrition, etc. *233 ills.; 678 pp.* *$12*

Order your books from:

THE RONALD PRESS COMPANY
15 East 26th St., New York 10

REGULATION FIELD CLOTHES

for

U. S. FOREST SERVICE PERSONNEL

Complete Price List on Request

THE FECHHEIMER BROS. CO.
UNIFORMS FOR OVER 75 YEARS
CINCINNATI 2, OHIO

BAKED ENAMEL
METAL FORESTRY SIGNS
for WOODLAND BOUNDARY MARKERS—NO TRESPASSING & FIRE WARNING SIGNS—LOCATION MARKERS—CRUISER TAGS—etc., any size to your specifications. WRITE FOR QUOTATIONS ON ALL YOUR SIGN NEEDS state size and quantity.
A. L. LIND COMPANY
3036 THOMAS AVENUE SOUTH
MINNEAPOLIS 10, MINNESOTA

PLANTING TREES?
Use a "FORESTER" or "CONSERVATOR" Planter
Complete information on request
UTILITY TOOL & BODY CO.
Clintonville, Wis.

FOR SALE
Slash, Loblolly, Longleaf
and
Shortleaf Pine Seed
In Wholesale Quantities
Treated with Rodent and Bird Repellent For Direct Seeding
For over ten years
a dependable source
for
Southern Pine Seed
SOUTHERN SEED COMPANY, INC.
Baldwin, Georgia

Forestry News

CHARLES S. COWAN, right, received the Western Forestry Award at the 49th meeting of the Western Forestry and Conservation Association held in San Francisco Dec. 10-12. Association President Waller H. Reed, Collins Pine Co., is shown presenting the award. Cowan retired in April 1958 as manager of the Washington Forest Protection Assoc., a post he held for 31 years.

Photo courtesy The Timberman

Western Forestry and Conservation Conference Held

The 49th conference of the Western Forestry and Conservation Association was held in San Francisco December 10-12, with nearly five hundred in attendance. The conference theme was "Conservation through Wise Use."

President Waller H. Reed presided at the opening session, at which Wendell T. Robie, chairman of the California State Board of Forestry, was the principal speaker. A report on association activities was given by H. R. Glascock, Jr., forest councel. Charles S. Cowan was presented with the association's annual western forestry award in the form of a specially designed plaque.

Individual sessions were devoted to a variety of subjects. The session on "Wise Use of Forest Lands" had as moderator Regional Forester Charles A. Connaughton. William S. Rosecrans read a paper on "Coordinating Land Use Research." W. S. Swingler, assistant chief of the Forest Service, made a report on the small ownership meetings sponsored during 1958 by the Forest Service.

For the session on forest protection from pests William D. Hagenstein served as moderator. Among the speakers were William S. Looney of Shelton, Wash., Robert L. Furniss of Portland, Ore., and Howard G. Hopkins of Medford, Ore. Charles S. Cowan presided at the session on protection from fire. Among the speakers were J. Whitney Floyd of Logan, Utah; Francis H. Raymong of Sacramento, Calif.; and Henry J. Vaux of Berkeley, Calif.

The final session was devoted to considerations for increasing timber production; E. F. Heacox presided. Frank Heyward, Jr. of Bogalusa, La. reported for the southern states. Hugh J. Hodgins of Vancouver, B. C. discussed progress in western Canada. Ernest L. Kolbe of Portland, Ore. reported for the western states.

President Arthur M. Roberts, McCall, Idaho, was re-elected for 1959. H. R. Glascock, Jr. was re-elected as forest counsel.

Wilm Named to New York Post

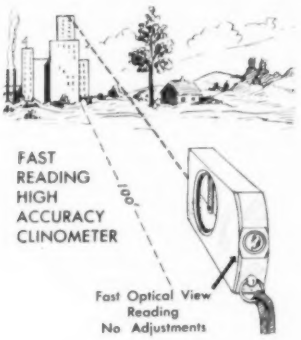
Governor Nelson Rockefeller has named Dr. Harold G. Wilm, associate dean of the State College of Forestry at Syracuse University, Syracuse, N. Y., commissioner of the New York State Conservation Department. He succeeds Sharon J. Mauhs.

Dr. Wilm was previously chief of the Division of Watershed Management Research in the Washington office of the U. S. Forest Service. At the time of his current appointment he was serving as director of the Society's Study of Education in Forestry and Related Fields of Natural Resource Management, a post he has held since the study was launched in June, 1958. He was also chairman of the Society

H. G. WILM

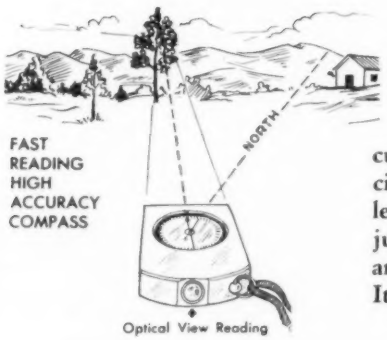
Get in Step With the Times

Don't plug along with yesterday's tools — take advantage of the precision and simplicity of the new High Accuracy Clinometer and error-free Compass. They will save you time and dollars!



HIGH ACCURACY CLINOMETER

The latest and by far the most compact vertical-angle measuring instrument ever made. It is time saving because there is nothing to turn, nothing to set, nothing to lock. You simply place it to your eye and sight on your objective. It is accurate to 3 inches in 100 feet—think of it! And it is surprisingly inexpensive, costing about half of what you would pay for an Abney Hand Level. Order Item 2C-45—today. The price is only $18.



HIGH ACCURACY COMPASS

Costly compass errors are no longer necessary. Today's High Accuracy Compass enables you to read bearings to the accuracy of 1/6 of one degree. And you do it with speed and precision—by merely holding the compact 4-ounce instrument at eye level and sighting on your target. You make no adjustments—just sight and read. A marvelous combination of built-in precision and error-free operation. And it is priced at only $13.95. Order Item 2C-40—now.

FORESTRY SUPPLIERS
INCORPORATED

P. O. Box 8305, Battlefield Station
Jackson 4, Mississippi
Telephone—FLeetwood 4-3565

What You Need—When You Need It!

DEWITT NELSON

Committee for the Advancement of Forestry Education. He has relinquished both posts concurrent with assumption of his new duties.

The New York Conservation Department includes departments of Lands and Forests, Fish and Game, Conservation Education, Parks, and Water Power and Control.

Nelson Reappointed Director California Natural Resources

DeWitt Nelson, who has served as director of the Department of Natural Resources for the State of California since his appointment in 1953 by then Governor Earl Warren, was reappointed by Governor Edmund G. Brown, inaugurated as California's governor on January 5.

Well known to foresters throughout the nation, Mr. Nelson is a former president of the Society of American Foresters (1955-1956) and is a Fellow of the Society.

In California the office of director of natural resources is of cabinet rank in the state government.

Goddard Renamed Secretary of Forests and Waters

Maurice K. Goddard, who has served as secretary of the Pennsylvania Department of Forests and Waters during the period 1955-1958, was reappointed by Governor David L. Lawrence for a second four-year term.

In order to accept the original appointment, Mr. Goddard was given leave of absence from the directorship of the School of Forestry, Pennsylvania State University. In order to continue to serve in the governor's cabinet, he has submitted his resignation as director of the school.

M. K. GODDARD

Mr. Goddard joined the forestry faculty at Penn State in 1935 and was named director of the school in 1954.

He is a member of the Council of the Society of American Foresters, having been elected for the two-year term 1958-1959.

Egon Glesinger New Director FAO Forestry Division

Egon Glesinger has been appointed director of the Forestry Division of the Food and Agriculture Organization of the United Nations with headquarters in Rome, Italy. He succeeds Marcel Leloup, well-known French forester, who has been director during the past 12 years.

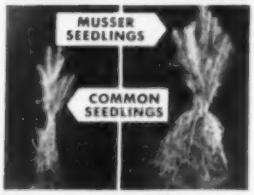
The Director-General of FAO, B. R. Sen, has also changed the name of the

*20 MILLION TREES A YEAR!
*NOW OVER 35 MILLION!

MUSSER TREES...
Make Better Timber Crops!

Prime timber begins with the seed. With Musser you are assured of Good Heredity characteristics through careful selection of seed. With Scientific Culture in Musser nurseries the seedlings develop the strong, extensively branched, compact root system necessary for extracting the most food from the soil of the planting site.

Musser offers the largest selection of quality trees at a price made possible through large quantity production.



Here are a few of the items listed in our catalog:

SPECIAL STRAIN SCOTCH PINE — Per 1000
Very best Christmas tree strain, from seed collected by our men from selected parent trees. Healthy, sturdy, straight-stemmed. Also all other best strains Scotch Pine.
2-yr. Seedlings, 3 to 6 ins. $25.00
2-yr. Seedlings, 5 to 10 ins..... 35.00

AUSTRIAN PINE — Austrian Alpine Stock
2-yr. Seedlings, 3 to 6 ins. $25.00

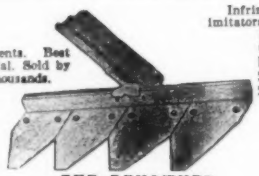
NORWAY SPRUCE — Special Strain Fast Growing
Fine for Christmas Trees, Ornamental and Timber.
2-yr Seedlings, 5 to 10 ins..... $35.00

DOUGLAS FIR — Hardy
2-yr. Seedlings, 4 to 8 ins..... $25.00
3-yr. Seedlings, 8 to 12 ins..... 55.00

Many other Evergreens—Hardwoods—Ornamentals—Shade Trees

Write for Catalog..
WITH WHOLESALE PLANTING LISTS. ASK FOR OUR FAMOUS CHRISTMAS TREE GROWERS' GUIDE

MUSSER FORESTS, INC. Box 26-B INDIANA, PA.



THE RENOWNED
CHARLES H. RICH
"Forest Fire Fighting Tool"
Write for Prices and Descriptions

C. H. RICH FOREST FIRE TOOL CO.
218 W. Bald Eagle St.
Lock Haven, Pa.

division to the Division of Forestry and Forest Products.

Dr. Glesinger is an economist widely acquainted in the United States.

Forest Products Research Society to Meet

The 1959 National Meeting of the Forest Products Research Society will be held June 29-July 3 in San Francisco.

Planning is under way on a top-flight technical program as well as a full round of field trips and a large selection of industrial exhibits, according to the recent announcement by Jeter Eason, president of the Society (and Vice President of Nickey Brothers, Memphis, Tennessee).

Technical sessions are scheduled by each of the Society's fourteen divisions: chemical utilization, industry education, gluing, logging, lumber manufacturing, marketing, quality control, packaging, veneer and plywood, composition board, drying, finishing, machining, and wood preservation.

Local arrangements for the meeting will be handled by the Northern California Section of the Society. General chairman for the meeting is Ray Berry, vice president of the Society and vice president and general manager of the Scott Lumber Co., Burney, Calif. Program chairman is Dr. E. S. Harrar, president-elect of the Society and dean of the School of Forestry, Duke University, Durham, North Carolina.

Private & Industrial

E. O. Ehrhart, President of Armstrong Forest Co., Retires

The retirement of E. O. Ehrhart at the end of 1958 as president of the Armstrong Forest Co., a subsidiary of New York & Pennsylvania Co., Inc., was announced in December. He was with the company for 43 years. Top executive responsibilities for Armstrong were assumed by Arthur L. Bennett, vice president.

Mr. Ehrhart's long and distinguished career in forestry has been intimately connected with many developments which have become standard practice in the management of woodlands and in the pulpwood industry.

He has served on many professional and industry committees in both the United States and Canada. He was a member of the Pulpwood Industry Advisory Committee for the War Production Board during World War II, and is currently director of the American Pulpwood Association.

E. O. EHRHART

He is chairman of the Northeastern Forest Tree Improvement Conference, Pennsylvania Forest Industries Committee, and was general chairman of the 50th Anniversary of the establishment of the Forestry School at Penn State. In addition, he is a member of the Canadian Pulp & Paper Association, the Canadian Institute of Forestry, the Society of American Foresters, the National Advisory Committee of American Forest Products Industries, Inc., Forest Policy Committee of the American Pulp & Paper Association, and is a member of the advisory council of the Northeastern Forest Experiment Station, U. S. Forest Service.

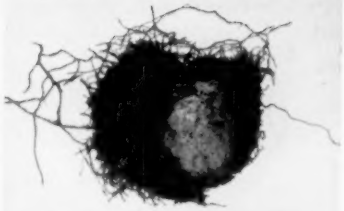
Forestry Appointments Announced

Robert S. Hyde has been appointed assistant to Paul M. Dunn, director of forestry of the St. Regis Paper Co., effective December 1, 1958. Mr. Hyde has been forest engineer in charge of forest engineering since 1956. He had been a member of the technical forest engineering staff of southern woodlands at Pensacola since 1952. Prior to joining St. Regis, Mr. Hyde was research forester with the Pennsylvania Department of Forests and Water, and with the U. S. Forest Service.

Mr. Hyde is a graduate of Dart-

From MORA CHEMICAL an amazing new pellet fertilizer for forest seedlings.

43% MORE



GROWTH!

In thoroughly replicated tests conducted by forest laboratories, this new pellet fertilizer from MORA CHEMICAL produced a 43% increase in growth the FIRST YEAR . . . an additional 56% increase the SECOND YEAR!

- No burning on species tested. (Douglas Fir, White Fir, Hybrid Pine, Monterey Pine, Sitka Spruce)
- Easy to handle . . . may be utilized with all types of planting methods.
- No evidence of increased animal damage.

Write today to TED WADSLEY for full details and prices . . . find out how YOU can profitably put this amazing fertilizer to work for you!

Chemical Manufacturers for Forest, Farm and Industry

MORA CHEMICAL
CORPORATION
3412 16th Avenue West
Seattle 99, Washington

Consulting Foresters

Professional Services Offered by
Members of the Society of American Foresters

Land Surveyors *Consulting Forest Engineers*

BELANGER and BOURGET

86 MOUNTAIN HILL, QUEBEC,
P.Q., CANADA

Forest Surveys and Inventories. Establishing of boundary lines.

Forest Management and Logging plans. Locations for Wood industries.

DOMESTIC TROPICAL

WEST COAST

GREENACRES, INC.

FOREST CONSULTANTS & APPRAISERS

4427 RAINIER AVE.
SEATTLE 8, WASH.
PArkway 5-7800

M. P. LAZARA
PERRY O. DONALDSON

KEITH CRANSTON, FORESTRY CONSULTANT
LELAND, MISSISSIPPI (HEADQUARTERS)

Professional services and nationwide loans on timberland, provided through *Connecticut General Life Insurance Co.*

Also supervision of estates; Management; Marketing; Appraisals; Forestry Personnel Placement with Industry.

FOREST MANAGEMENT

Topographic Mapping **Forest Development Studies**
Timber Stand Maps **Forest Inventories**
Land Classification **Forest Appraisals**

Hammon, Jensen & Wallen

MAPPING AND FORESTRY SERVICES

660 HEGENBERGER ROAD **OAKLAND 21, CALIFORNIA**

General Photogrammetric and Forestry Consulting Services

TIMBERLAND MANAGEMENT, INVENTORY AND APPRAISAL
—OVER 50 MILLION ACRES SINCE 1910

JAMES W. SEWALL COMPANY
FOREST ENGINEERS
OLD TOWN, MAINE

BRANCH: JAMES W. SEWALL CO. (CANADA) LTD., FREDERICTON, NEW BRUNSWICK

mouth College and received his Master's degree in forestry from the School of Forestry of Yale University. He will be located at the St. Regis office in New York.

Albert D. Ernest, Jr. became administrator of timber contracts for southern woodlands with headquarters at Jacksonville, Fla., effective January 1. Mr. Ernest joined the training program of St. Regis in 1955 and served as sales representative at Cleveland Corrugated Box Company division of St. Regis Container Company, at Cleveland, Ohio, since 1957. He had also served as a timber cruiser for St. Regis at Fargo, Ga.

Hildebrand to New Mead Post

W. H. Hildebrand has been named assistant director of wood procurement for The Mead Corporation, Chillicothe, Ohio. He has been northern wood procurement manager for the last five years.

Hildebrand joined Mead in 1948 as manager of wood and lands for the Michigan Division. In 1951, he transferred to Chillicothe as a member of the corporation staff. Three years later, he was promoted to northern wood procurement manager. He is a forestry graduate of the University of Michigan and is currently president of the Ohio Forestry Association.

Olin Mathieson Opens New Research Center

Olin Mathieson Chemical Corporation has opened a new research center and plans an accelerated program of research and product development at its forest products operations, it has been announced by M. H. Collet, vice president and general manager for forest products.

The new facility, called the "Frostkraft Research Center," is located in West Monroe, La. More intensive research towards utilization of local hardwoods as a raw material will be one of the major objectives of the 1959 program, according to Collet.

R. B. Buchman Joins Lumber Concern in Mexico

Robert B. Buchman, for several years plant coordinator with the Kennecott Copper Corp., Salt Lake City, Utah has accepted a position in southern Mexico. He will be milling and marketing operations superintendent for a lumber concern at Acapulco, Guerrero, Mexico.

Public

LESTER MONCRIEF

Moncrief Retires as Assistant Regional Forester

The retirement of Lester Moncrief, assistant regional forester in charge of Timber Management for the Intermountain Region of the U. S. Forest Service, Ogden, Utah, has been announced.

Regional Forester Floyd Iverson made the announcement in December.

A native of Indianapolis, Mr. Moncrief is a graduate of the University of Washington and served with the U. S. Marine Corps in World War I. He began his period of 36 years in public service as an assistant forest ranger in 1925 on the Ranier National Forest in Washington. He became head of timber management activities for the Intermountain Region in 1954.

Mr. Iverson announced that Joel Frykman has been promoted to succeed Mr. Moncrief. Frykman is a graduate of the School of Forestry, University of Montana. He entered the Forest Service with the Northern Rocky Mountain Experiment Station in 1934. Awarded a scholarship to Yale University in 1942, he received a Master of Forestry degree from there in 1943, and was assigned to the Cherokee National Forest as assistant supervisor.

Mr. Frykman was promoted to supervisor of the Cache National Forest, Utah, in 1951 and became assistant to the chief of timber management at Ogden in 1954.

The retirement and promotion were effective January 1.

JOEL FRYKMAN

New Seed Storage Laboratory Is Now in Use

The U. S. Department of Agriculture's new National Seed Storage Laboratory at Colorado State University in Fort Collins was dedicated December 5th.

Although the laboratory is intended primarily for the storage of seeds to be used by plant breeders of agricultural crops, its facilities are also available to qualified research foresters, nurserymen, tree seed companies, and forest geneticists.

Built at a cost of $450,000, the repository has storage space for 300,000 quart-sized samples. Already it has been dubbed "the Fort Knox of the seed world."

Nine of its storage rooms provide for independently controlled temperatures ranging from 20 to 40 degrees F., and can be brought down to a relative humidity of 35 percent. A tenth room provides a controlled temperature of 35 degrees F. In addition an eleventh room is designed for stratification to induce germination of dormant seed.

The laboratory will be administered by the Crops Research Division of the Agricultural Research Service. Dr. Edwin James has been named director of the new laboratory.

Assistant Secretary of Agriculture Ervin L. Peterson was the principal speaker at the dedication ceremonies.

WILLIAM A. EASTMAN, JR.
Consulting Forester
Complete Professional Service
SEATTLE 1, WASHINGTON
410 J. GREEN BUILDING
'Phone MAin 4-2814

PAUL M. SANDERS
Consulting Forester
916 YEON BLDG.
PORTLAND 4, OREGON
Telephone: CApitol 8-3536

POND & MOYER CO., INC.
Consulting Foresters
Estimates—Appraisals—Surveys
Machine Tree Planting Service
107 HOMESTEAD RD., ITHACA, N. Y.

Reforestation Arboriculture
S. GAYLEY ATKINSON
Consulting Forester
Huntingdon Road
Huntingdon Valley, Pa.

TREE FARM MANAGEMENT SERVICE
1166-7th Avenue, West, Eugene, Oregon
Protection—Reforestation—Inventory
Utilization—Research
Verne D. Bronson, Chief forester, Phone 5-5371

ALBERT G. HALL
Forestry Relations Counsel
Consulting Forester
Member, Association of Consulting Foresters
810 18th St., N.W., Washington 6, D.C.

PAUL T. WINSLOW
Consulting Forest Engineer
ESTIMATES—APPRAISALS—MANAGEMENT
STAATSBURGH-ON-HUDSON, N. Y.

SOIL SCIENTISTS **T. S. Coile, Inc.** FORESTERS
Forest Land Consultants
ROUTE 2, BOX 376, DURHAM, N. C. *Phones: 8-9240; 4902*
Land Appraisal — Timber Inventories — Soil-Site Surveys
Forest Management Planning — Growth Prediction — Research
"Forest Management Based on Soil Productivity"

WILLIAM D. DRATZ
Consulting Forester
Complete Professional Service
144 Fairview Ave.
Missoula, Montana Phone 9-0387

G. Ed. KNAPP
D. L. Martindale
Consulting Foresters
1410 Broadway
MACON, GEORGIA

JOHN G. GUTHRIE
Consulting Forester
BOX 517 WIGGINS, MISS.
PHONE WALNUT 8-4958

TIMBER MANAGEMENT SERVICE
R. W. MEZGER
Consulting Forester
Member, Association of Consulting Foresters
Klamath Falls, Oregon

FRANK J. LEMIEUX
Forester
833 WHITNEY BUILDING
NEW ORLEANS, LA.

Porcius F. Crank, Jr.
Consulting Forester
Point Harbor North Carolina

NORTHERN TREE COMPANY
Professional Forestry Services
Thomas F. Schweigert, Pres.
Member, Association of Consulting Foresters
Penney Building
Petoskey Michigan

JACK M. HALL
Consulting Forester
Appraisals - Selective Marking
Machine Tree Planting Service
MOULTRIE, GEORGIA

Kampmann on ICA Iran Assignment

Tifterist S. Kampmann has accepted an assignment to the International Cooperation Administration and will go to Iran, according to an announcement by Regional Forester J. Herbert Stone of the Pacific Northwest Region of the U. S. Forest Service. Since June of 1956 Kampmann has been in the regional division of timber management at the Forest Service Portland headquarters.

Kampmann is a native of Wisconsin and a forestry graduate of the University of Michigan (1932). He received an M.F. degree in 1933 from Yale University. In 1933 he entered the Forest Service in the North Central Region on the Chequamegon National Forest in the Civilian Conservation Corps program. His new duties began in January.

Copeland Heads Intermountain Division

Dr. Otis L. Copeland has been promoted to chief of the Division of Watershed Management Research of the Intermountain Forest and Range Experiment Station, Ogden, Utah, according to an announcement by Director Reed W. Bailey. Copeland succeeds George W. Craddock who was recently appointed head of the Division of Station Management after many years' service as chief of Watershed Management.

Dr. Copeland has been with the Intermountain Station since 1954. For three years he worked at the Inland Empire Research Center, Spokane, Washington, where he studied causes of the pole blight disease of white pine. Since joining the station director's staff in 1957, his work has been related primarily to research in soils and watershed management.

Davidson Is New Extension Forester in Iowa

Robert R. Davidson has been appointed extension forester in Iowa, with duties beginning in January.

Davidson is a native of Milwaukee, Wis., and studied at the University of Minnesota where he received both his B.S. and M.F. degrees.

Awarded Science Foundation Fellowship

J. H. Stoeckeler of the Lake States Forest Experiment Station, St. Paul, Minn., has been awarded a National Science Foundation Senior Postdoctoral Fellowship for a year's study abroad. His subject of investigation will be the drainage of forest swamps and its various aspects in Sweden, Finland, and Germany. He plans to leave for Europe in July.

Schools

Robert Zahner Appointed to Michigan U. Staff

Dean Stanley G. Fontanna, School of Natural Resources, The University of Michigan, announces the appointment of Dr. Robert Zahner as lecturer in the Department of Forestry to fill the forest soils — watershed management position vacated by Dr. Robert Dils, who left the School last September to head up the new Watershed Management Unit at Colorado State College.

After three years in the U. S. Army Air Force Dr. Zahner entered Duke University where he received the B.S. degree in 1950, the M.F. degree in 1951, and the Ph.D. degree in 1953. From 1953 to the present time he has been employed as a soil scientist at the Crossett Research Center of the Southern Forest Experiment Station, working primarily in the field of forest tree-soil-water relationships. As project leader in forest soils research, he directed research in 15 active studies.

Dr. Zahner has published extensively in the soils-water field. He is a member of Phi Beta Kappa, Sigma Xi, Phi Eta Sigma, the Society of American Foresters, and the Soil Science Society of America.

Dr. Zahner takes over his new position as of February, and will teach both undergraduate and graduate courses in forest soils and watershed management.

Missouri Holds Forestry Conference

More than 350 people attended the Missouri Forest Resource Conference which was held in the Auditorium of Jesse Hall at the University of Missouri on October 18. The School of Forestry, the Division of Continuing Education of the University of Missouri, and the Missouri Forest Resource Committee cooperated with thirty-one agencies in sponsoring the meeting. The

POMEROY & McGOWIN
FOREST MANAGERS
Monticello, Arkansas Chapman, Alabama

purpose of the Conference was to review progress wsich has been made in forestry in Missouri during the past twenty-five years, to take stock of the present situation, and to outline the problems which must be resolved in the near future if Missouri is to capitalize on its forest resources which occupy 15 million acres of forest land. From the content of the papers which were presented it was apparent that the most urgent needs of Missouri's forest program is (1) an extension of protection to all forest lands, along with an intensification of the protection activity, (2) an expansion in all phases of forestry and wood products research, (3) the attraction of new wood-using industries to the state, and (4) broadening of the education of the landowners and others concerned with the management of forest land and the utilization of the timber resource. The facets of Missouri's forest potential, including industry, wildlife, water, recreation and people, were covered by eleven speakers.

A. L. McComb Accepts Position at Arizona University

After 23 years on the staff of the Iowa State College, Ames, A. L. McComb has resigned to head a new Department of Watershed Management at the University of Arizona. His resignation becomes effective February 28.

Before joining the staff at Iowa State in 1935 Dr. McComb worked for a time as a nurseryman for the Soil Conservation Service. During two periods when he was on leave from the college, Dr. McComb worked in South America and Australia.

He is a graduate of Penn State University and received his M.S. and Ph.D. degrees from Iowa State.

Oregon Forestry Centennial Conference Plans

Program plans for the special two-day Forestry Centennial Conference at Oregon State College February 20 and 21 have been announced by the College's School of Forestry.

Theme of the conference will be "The Next Hundred Years in Forstry." Dean Henry J. Vaux of the University of California School of Forestry will be conference leader.

The conference will emphasize the scientific strides in store for North American forestry, their effects on forestry practices and utilization, and some of the major pressures which will affect forestry.

J. E. O'Leary to Lead Foresters' Tour of Europe

With John E. O'Leary, professor at Oregon State College, Corvallis, as a guide, foresters will have an opportunity to see some of the highlights of European forestry in September.

A 21-day survey of lumbering operations in Finland, Sweden, Germany, and Austria has been arranged with Air France at a cost of $1,616 from New York, first class, all inclusive ($1,272 economy class). The tour will leave New York September 5 and return September 25.

Professor O'Leary studied in Austria in 1955 under a Fulbright scholarship and subsequently toured most of Europe.

Further information is available from Professor O'Leary or the district manager of Air France, 323 Geary Street, San Francisco, Calif.

Industrial Forestry Seminars Scheduled

The Yale School of Forestry has announced that its tenth Industrial Forestry Seminar will be held March 2-13 in Crossett, Ark., in cooperation with The Crossett Company. The eleventh will be held at the School in New Haven, Conn., April 6-17. Z. W. White, professor of industrial forestry, will direct each seminar.

Short Course in Forest Photogrammetry

A five-day course in the application and use of aerial photographs in forestry will be held at the College of Forestry, University of Washington, Seattle, March 16-20.

The short course is directed, not to the professional photogrammetric engineer, but to the practicing forester and cruiser who uses, or plans to use, aerial photographs, and relatively simple air survey tools in his work. Guest lecturer will be Karl E. Moessner, photogrammetrist, Intermountain Forest and Range Experiment Station, Ogden, Utah.

For further particulars write: Professor J. C. H. Robertson, College of Forestry, University of Washington, Seattle.

Yale Announces Fellowships, Scholarships Available

About 25 fellowships and scholarships are made available annually by the Yale School of Forestry, New Haven, Conn. Recipients are required to pay tuition charges and regular labo-

COST ESTIMATES—TAX APPRAISALS—CRUISING SURVEYS AND MANAGEMENT
IDAHO ★ BOISE
INTERMOUNTAIN TIMBER SERVICE
4101 STATE ST.
PHONE 2-4300
THOMAS (TOM) C. CLIFTON

WILLIAM H. PRICE
FOREST MANAGEMENT
Specializing in Timber Tax Problems
2626 W. Lynn—Seattle 99, Wash.
Al der 7482

Consulting Forester Forest Surveyor
JOHN STOCK
Specializing in Adirondack Forest and Tax Problems
Box 311 Tupper Lake, N. Y.

FOREST PROPERTY
Estimates—Appraisals—Management
Prentiss & Carlisle Co., Inc.
107 Court Street Bangor, Maine

ADIRONDACK FORESTRY, INC.
David E. Strong Donald E. Peterson
Consultants
Estimates, Appraisals, Marketing
Management Plans, Tree Planting, Preservation
WILMINGTON, NEW YORK

R. B. SHANNON & ASSOCIATES
— *Consulting Professional* —
Engineers Foresters
Surveyors Landscape Architects
KITTANNING and INDIANA, PENNA.

GEORGE BANZHAF & COMPANY
822 North Water Street MILWAUKEE 2 BRoadway 6-2062
Consultants to the Wood Using Industries

Index to Advertisers

	Page
Adirondack Forestry, Inc.	159
Atkinson, S. Gayley	157
Banzhaf, George & Co.	159
Bartlett Mfg. Co.	142
Belanger & Bourget	156
Calvert School	138
Caterpillar Tractor Co.	149
Coile, T. S.	157
Crank, Porcius F. Jr.	158
Cranston, Keith	156
Deere & Co.	137
Dratz, Wm. D.	158
Eastman, Wm. A. Jr.	157
Fechheimer Bros.	152
Forest Seeds of California	140
Forestry Suppliers, Inc.	153
Forestview Evergreen Nursery	146
Greenacres, Inc.	156
Guthrie, John G.	158
Hall, Albert G.	157
Hall, Jack M.	158
Hammon, Jensen & Wallen	156
Haynes Mfg. Co.	141
Homelite Corporation	Back Cover
Intermountain Timber Service	159
International Harvester Co.	139
Keene Forestry Assn.	141
Knapp, G. Ed.	158
Lemieux, Frank J.	158
Lind, A. L. Co.	152
Lowther, Harry A. Co.	140
McCulloch Corporation	144, 145
Meadows, Ben Co.	143
Mora Chemical Corporation	155
Motorola	3rd Cover
Musser Forests, Inc.	154
National Agricultural Supply Co.	148
Nelson Company	147
Northern Tree Co.	158
Omark Industries	82
Pacific Weather Service	142
Paint Creek Nurseries	143
Panama Pump Co.	141
Pomeroy & McGowin	158
Pond & Moyer	157
Prentiss & Carlisle	159
Price, Wm. H.	159
Rich, C. H. Forest Fire Tool Co.	154
Ronald Press Co.	151
Rootspred Tree Planter	146
Sanders, Paul M.	157
Sebrell, J. B. Corporation	140
Sewall, James W. Co.	156
Shannon, R. B. & Assoc.	159
Silva, Inc.	142
Smith, D. B. Co.	2nd Cover
Southern Coatings & Chemical Co.	150
Southern Seed Co.	152
Stewart, Fred Associates	142
Stock, John W.	159
Suncrest Evergreen Nurseries	142
Timber Mgmt. Service	158
Tree Farm Mgmt. Service	157
Utility Tool & Body Co.	152
Western Fire Equipment Co.	138
Winslow, Paul T.	157
Woodlot Seed Co.	138

ratory fees, but no assistance in teaching or research or other service is demanded of them. The following grants are available for the 1959-1960 school year:

WILLIAM HENRY SAGE, CHARLES BOUGHTON WOOD, and CHARLES W. GOODYEAR FELLOWSHIPS AND SCHOLARSHIPS—These grants include fellowships of $750 to $1,200 each, and scholarships covering the cost of tuition.

UNIVERSITY FELLOWSHIPS IN FOREST BIOLOGY—Up to $2,000—Available to prospective candidates for the Ph.D. degree whose studies involve investigation into the biological foundations of forestry.

CHARLES S. CHAPMAN MEMORIAL FELLOWSHIPS IN INDUSTRIAL FORESTRY (Weyerhaeuser Timber Foundation)—$850 to $1,650—Available to men interested in advanced study and research in the field of industrial forestry.

UNION BAG-CAMP CORPORATION FELLOWSHIP—$2,000—Available only to legal residents of Florida, Georgia, South Carolina, North Carolina, Virginia, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, or Texas.

CROWN ZELLERBACH FOUNDATION FELLOWSHIP—$1,200—Available to graduates of institutions in Oregon and Washington.

Prospective candidates for the Ph.D. degree are also eligible to apply for certain fellowships offered by the Graduate School.

Further information and application forms for fellowships, scholarships, and assistantships may be obtained from the Registrar, Yale School of Forestry, 205 Prospect Street, New Haven 11, Conn. Applications should be filed by February 15.

Scholarship Deadline Nears at Syracuse

March 1 is the deadline for applying for scholarships, fellowships, or assistantships at the State University College of Forestry at Syracuse University for the 1959-1960 term.

Research fellowships, with values beginning at $2,000 plus exemption from tuition and laboratory fees, are being offered by industry, research foundations, and government agencies. Twenty-four assistantships will pay about $1,400 to $1,600 and exemption of tuition and fees. A limited number of scholarships waiving fees for out-of-state students are also available.

Applications and details may be obtained from the associate dean for graduate studies at the college.

Forestry Employment

Positions Available

Openings for Junior Foresters, in management and procurement with large sawmill operation in central Louisiana. Starting salary $400-$440 per month with opportunity for advancement. Prefer married man with southern forestry background. *Write full details of experience, education, and references.* **Norman Martin, c/o Roy O. Martin Lumber Co., Alexandria, La.**

Vacancy for assistant professor of forestry starting September 1st at Humboldt State College, Arcata, Calif. Should have completed, or near completion, work for doctor's degree, with teaching experience. Under age 45 preferred. Starting salary $6060-$6360 for nine months academic year. To teach general forestry courses including mensuration and protection (fire); 12 lecture hours weekly. Send application by letter with recent photograph to Dr. Homer P. Balabanis, Dean of Instruction, Humboldt State College, Arcata, Calif.

Extension Agent to administer 4-H Camping Program in New Jersey. Requires supervision and training of summer camp; planning country camping programs; preparation of camp promotion literature; planning and handling camp budgets; supervision of camp buildings and surrounding forest land. Background required: B.S. Degree; administrative ability; camping experience; 4-H or Extension experience preferred, but not essential. Salary dependent on experience and training. If qualified and interested write to State 4-H Club Leader, Extension Building, College of Agriculture, New Brunswick, New Jersey.

Positions Wanted

Forester desires responsible position in forest management or allied fields in northern or western states, Alaska, or Hawaii. Will consider foreign assignment. Have 7 years experience in the technical management of industrial tree farms, logging supervision, land acquisition, wood procurement, public relations. Now employed as Chief-Forester, mid-western lumber company.
Box U, Journal of Forestry, Mills Building, Washington 6, D. C.

Forester, B.S., 1955; Geology, B.S., 1958, both accredited colleges. Age 29, married. Experience in Northwest and Southern forest; the latter as District Forester of 45,000 acres of intensively managed forest including all phases of pine and hardwoods prior to attaining geology degree. Consider all states, prefer northern or western state.
Box V, Journal of Forestry, Mills Building, Washington 6, D. C.

Forester, B.S., 1940. Age 41, married, considerable family responsibility. 14 years southern forestry experience including 3 years with government, 8 years with pulp and paper mill, 3 years pulpwood dealer. Desire return to industrial forestry about July 1959. Experience in all phases forestry, logging, pulpwood production. Prefer mid-south.
Box W, Journal of Forestry, Mills Building, Washington 6, D. C.

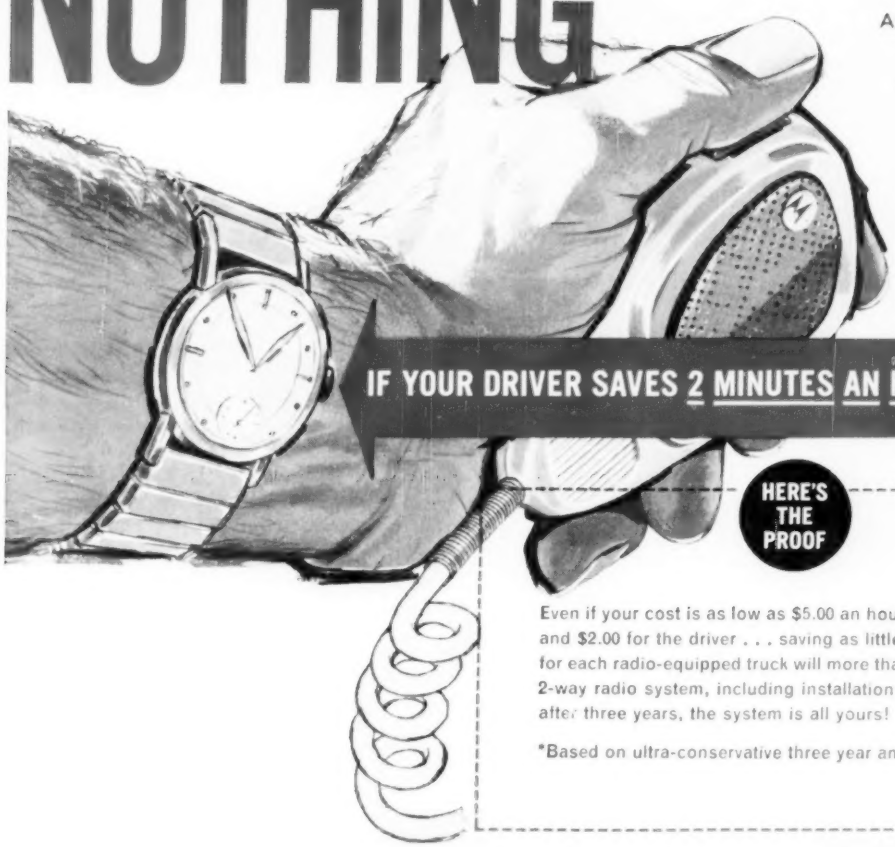
Registered forester and land surveyor. Eight years experience in forest management and land surveying including reforestation, aerial photo interpretation and mapping, timber inventory on tracts up to 50,000 acres, log scaling, timber sales, drafting experience, supervision of personnel. Now employed with limited advancement possibilities. Interested in private industry or consulting work in Central or Lake States Region.
Box X, Journal of Forestry, Mills Building, Washington 6, D. C.

Forester, B.S.F., 1958, Purdue Univ. Age 23, single, veteran. Experience: Three summers work with U.S.F.S., in Minnesota, Oregon, and Lake States Experimental Station working in Wisconsin. Summer employment has included blister rust control, T.S.I., timber sales, and forest survey. Desire work in forest management, silviculture, procurement, nursery, or related work in any location.
Box Y, Journal of Forestry, Mills Building, Washington 6, D. C.

MOTOROLA 2-WAY RADIO COSTS YOU NOTHING

With 2-way radio, the logging superintendent is in immediate touch with each of his key personnel all day long. Problems in safety, personnel welfare, breakdown, landing clog-ups, supervisory decisions and forest protection can be handled on the spot. If each mobile unit saves only two minutes an hour, Motorola radio pays for itself. And in times of emergency, the 2-way radio is invaluable.

Add up the benefits yourself. You'll see why Motorola 2-way radio actually makes money for you. Why delay any longer? Contact Motorola today.



IF YOUR DRIVER SAVES 2 MINUTES AN HOUR WITH RADIO

HERE'S THE PROOF

Even if your cost is as low as $5.00 an hour . . . $3.00 for the truck and $2.00 for the driver . . . saving as little as 2 minutes an hour* for each radio-equipped truck will more than pay for your Motorola 2-way radio system, including installation and maintenance. And after three years, the system is all yours!

*Based on ultra-conservative three year amortization schedule.

MOTOROLA *2-WAY RADIO*

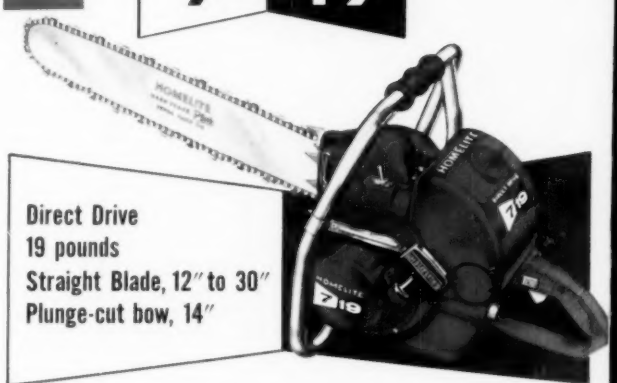
MOTOROLA COMMUNICATIONS & ELECTRONICS, INC. • A Subsidiary of Motorola, Inc. • 4501 Augusta Blvd. • Chicago 51, Illinois

Go into a Partnership for Profit with the New HOMELITE 7 19

That's right! The new Homelite 7-19 chain saw is ready to go into partnership to let you *make* more money, *save* more money. Ideal for the production cutter, the 7-19 has a speedy direct drive that cuts through 18″ softwood in 12 seconds, 8″ hardwood in 4 seconds, fells trees up to 5 feet in diameter. Its balanced 19 pounds* means easier, safer handling in any location, any cutting position . . . lets you cut longer with less effort.

And the 7-19 has all of Homelite's Magic 7 features that give you greater dependability, longer life and less maintenance — automatic governor to maintain proper chain speed . . . tough, drop forged counterbalanced crankshaft to assure smooth running with less operator fatigue . . . large air filter to keep out sawdust, dirt and snow . . . simple piston pump oiling . . . automatic clutch to stop chain when throttle is released . . . revolutionary intake valve to increase engine power . . . and the famous Homelite high compression short stroke engine design that delivers full power in any cutting position.

Join a money making partnership. See a free demonstration of the Homelite 7-19 chain saw at your nearby Homelite dealer's.



Direct Drive
19 pounds
Straight Blade, 12″ to 30″
Plunge-cut bow, 14″

Guaranteed for a Full 7 Months . . .

*less bar and chain

HOMELITE

A DIVISION OF TEXTRON INC.

4102 RIVERDALE AVE., PORT CHESTER, NEW YORK

Manufacturers of carryable pumps, generators, chain saws, blowers.

Find Your Homelite Dealer In The 'Yellow Pages'

In Canada:
Terry Machinery Co., Ltd.